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EDITED BY

F. J. KILLINGTON, D.Sc., A.L.S., F.R.E.S., F.S.B.E.

WITH THE ASSISTANCE OF

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JOURNAL OF THE SOCIETY FOR BRITISH ENTOMOLOGY

VOL. 2. 7TH NOVEMBER, 1939. PART 1.

NOTES ON THE MIGRATION OF SOME AQUATIC INSECTS.

By T. T. MACAN, M.A., F.R.E.S.

(Laboratory of the Freshwater Biological Association, Wray Castle, Ambleside, Westmorland.)

The movements of animals from one locality to another are of importance to all persons concerned with fresh water, whether they be interested in fishing, waterworks or biology. To the ecologist, a knowledge of the extent to which the animals he is studying are likely to arrive in, or leave, any particular habitat is of special importance. For the Hemiptera-Heteroptera, the group with which this paper is largely concerned, Hutchinson (1933) gives a list of records of Corixidae and Notonectidae in flight, Walton (1935) describes experiments on the flight of *Notonecta,* and Thomas (1938) describes the results of collecting with a light-trap. On the whole, however, there are very few publications on this subject, and I therefore venture to put on record the following two sets of observations. The first describes two occasions on which Corixidae were actually seen in flight. The second is concerned with the question of how often this happens; it describes collections made during the last six years in the basin of the fountain at King's College, Cambridge, a locality of which the chief interest is the fact that it is cleaned out several times a year.

1. OBSERVATIONS ON CORIXIDAE IN FLIGHT.

Corixidae have been seen on the wing on two occasions. On the first, the most important species was *Sigara lateralis* (Leach) (*hieroglyphica* Duf.), which was found flying into peat pools at an altitude of about 2,500 ft. on the Lake District fells. The second observation was also in the Lake District, though at a much lower altitude. *Sigara fossarum* (Leach) and *Sigara distincta* (Fieb.) were seen taking wing and leaving a pond.

S. lateralis is a rare species in the Lake District, though it is found occasionally in peat pools high up on the fells, as the following figures, which exclude the five pools mentioned below, indicate:—

Pools:	Total number examined	...	38
	Number with *S. lateralis*	...	8
Corixids:	Total number taken ...	...	618
	Number of *S. lateralis*	...	19

The figures are based on the results of three years' collecting; of the total of 618 specimens 88 per cent. belonged to two species, *S. wollastoni* (D. & S.) or *S. nigrolineata* (Fieb.), both of which are equally abundant. On 4th October, 1936, I visited with Mr. K. R. Allen, for whose assistance I am grateful, five pools near Watson's Dodd and Great Dodd, two peaks at the northern end of the Helvellyn range and made the following collection of species:—

Sigara wollastoni (D. & S.) ...		49 (♂ 18, ♀ 31)
S. lateralis (Leach) ...	...	41 (♂ 21, ♀ 20)
S. nigrolineata (Fieb.)	...	27 (♂ 14, ♀ 13)
Corixa punctata Illig. (*geoffroyi* Leach)	...	7 (♂ 5, ♀ 2)
Sigara praeusta (Fieb.)	...	1 (♂)
S. venusta (D. & S.) ...	...	1 (♀)

Six months later, in the following spring, Miss J. Wans, to whom my thanks are due, made a collection of Corixids from the same pools; it did not contain a single specimen of *S. lateralis*. The unusually high proportion of this species in October, 1936, was apparently due to an immigration which was actually in progress while we were collecting, for we noticed at the second pool that Corixids were dropping into it from the air. Forty-five minutes spent catching the bugs as they hit the water yielded the following collection:—

S. lateralis	...	...	19 (♂ 3, ♀ 16)
S. nigrolineata ...		...	3 (♂ 2, ♀ 1)
S. concinna (Fieb.)		...	1 (♂)

The pools are situated just less than 2,500 feet above sea-level. The flighting was observed between 4 p.m. and 5 p.m. on a bright, sunny afternoon, with light airs from the south-east. The Corixids approached from a north-westerly direction, against the wind, and usually five or six arrived, one close behind the other; then there would be a lull of three or four minutes before the first of the next batch appeared. No flighting was observed earlier in the day at a pool on top of the ridge, though *S. lateralis* was present in the water.

As already stated, *S. lateralis* is rare in the Lake District, and I have never found a locality where it may be taken abundantly. It seems probable, therefore, that the specimens may have come from outside the District, in which case they must have travelled at least six miles, and probably considerably more. The area affected by the migration appears to have been local, for in three pools about a mile further south no *S. lateralis* were found. Three days later some pools about two miles to the southward, near Helvellyn, were investigated and very few *S. lateralis* were found in them, but a number was found in a pool on the top of Seat Sandal, a peak which is about five and a half miles south of the pools where the flighting was observed.

On the second occasion it was the start of a flight that was observed, and the Corixids were seen leaving the water. The locality was a pond near Wray Castle in the Lake District. It has a surface area of about 900 square yards, a depth of about 5 ft. and is dug out of a bed of boulder clay. Nine species of Corixid have been recorded from it, but *S. distincta* and *S. fossarum* are by far the commonest species. No collection was made of the flying specimens. On 31st May, 1937, it was noticed that Corixids were leaving the water and flying away. They came rapidly to the surface, broke through it, rested on it for an instant and then spread their wings and flew away. Between 4.30 p.m. and 5 p.m. a few square yards in one corner were watched, and it was estimated very roughly that the bugs were leaving at the rate of one every minute, though many more were making abortive efforts which did not take them clear of the water. Those which got away successfully flew off down wind. At 6.30 p.m. there were considerably fewer specimens breaking through the surface.

The afternoon was hot and oppressive, with the sun just visible through high cloud. Between 4.30 p.m. and 5 p.m. the wind was light and blew from the north-east; at 6.30 p.m. it was dead calm with occasional light airs from a south-westerly direction.

Thus hot, still days appear to stimulate the flight of Corixidae. Whether or not they fly at night as well remains unsettled, though Thomas' (1938) record of forty-two in a light-trap in four years indicates that they do not come to light to any great extent.

2. The Fauna of King's College Fountain.

The fountain consists of a central column from which the water plays on Sundays, some small bowls on the column and a large main basin flush with the ground. This main basin, the only one from which insects were collected, is a circular con-

crete trough, about 6 ft. across, 2 ft. deep and 18 ft. external diameter. The water is drawn from the town supply, which was fitted with a softener in May, 1935. The analysis in Table 1 from Porteous and Suckling (1935) was kindly supplied by Mr. H. C. Gilson.

TABLE 1.

Cambridge Water Supply.

Analysis before and after installation of softener.

	Before.	After.	
CO_3	117	120	mgms. per litre
Cl	14	14	,, ,,
SO_4	18·5	18·5	,, ,,
Ca	92·5	43·5	,, ,,
Mg	2	1	,, ,,
Na	5·3	65·8	,, ,,
NO_2 nitrogen ..	—	—	,, ,,
NO_3 nitrogen ..	4·7	4·7	,, ,,
NH_3 free ...	—	0·006	,, ,,
NH_3 albuminoid	0·004	0·004	,, ,,

The flora of the fountain was thoroughly investigated during 1933 and 1934 by Messrs. P. W. Richards, T. G. Tutin and E. F. Warburg, who found that the bottom of the main basin was covered by a felt made up chiefly of the blue-green alga *Phormidium tenue* (Menegh.) Gom., with which was associated the Desmid *Cosmarium laeve* Rabenh. Filamentous forms were very scarce.

I am indebted to the head porter, Mr. Powell, for the following details. The fountain is usually cleaned out each vacation, that is four times a year, in March, June, September and December. During the years 1932 to 1935 it was cleaned out less often, about twice a year, in March and September, and it also received more fouling by pigeons. Mr. E. T. Burtt has watched the cleaning and describes it as very thorough and likely to remove all the fauna. He also states that it is not possible for the insects to be introduced with the water with which the fountain is refilled.

Collections of Coleoptera and Heteroptera have been made once or twice a year and the species found are shown in Table 2. I am greatly indebted to Mr. E. T. Burtt, who made all the collections after 1935, and to Professor F. Balfour-Browne, who named the beetles. When a cleaning is known to have intervened between two collections they are separated by a thick line in Table 2, but it is probable that a cleaning intervened between each collection except perhaps those of November,

TABLE 2.

Collections made in King's Fountain.

	1933. Jan. ♂	♀	May. ♂	♀	1934. Nov. ♂	♀	1935. Mar. ♂	♀	May. ♂	♀	1936. May. ♂	♀	Dec. ♂	♀	1937. July. ♂	♀	1938. Mar. ♂	♀	May. ♂	♀
HETEROPTERA.																				
CORIXIDAE.																				
Sigara sahlbergi (Fieb.)		1	2	2			1	3									3	2		1
S. linnei (Fieb.)		1	1	2																
S. nigrolineata (Fieb.)				2								1			1	3				
S. lateralis (Leach)				1	6	5	8	21	pres		1	3	1	5	1	1				
Corixa punctata Illig.					3	5	2	6	pres											
Sigara praeusta (Fieb.)																4				
S. selecta (Fieb.)											1									
NOTONECTIDAE.																				
Notonecta glauca Linn.		5						1	1						4					
COLEOPTERA.																				
DYTISCIDAE.																				
Colymbetes fuscus (Linn.)		12		2+		2		3	1											
Agabus nebulosus (Forst.)		1		2				2												
A. bipustulatus (Linn.)		6		1																
Hydroporus planus (Fab.)		1		5+		3		7	3		2							1		
H. pubescens (Linn.)				3		2														
H. palustris (Linn.)						1														
H. halensis (Fab.)											1									
H. confluens (Fab.)											1									
H. tessellatus (Drap.)								2												
Hygrotus impressopunctatus (Sch.)				1																
Laccophilus minutus (Linn.)											1									
Acilius sulcatus Linn.								1												
HYGROBIIDAE.																				
Hygrobia tarda (Herbst)						1														
HALIPLIDAE.																				
Haliplus wehnckei (Gerh.)						1														
H. lineatocollis (Marsh)								1												
HYDROPHILIDAE.																				
Limnebius papposus (Muls.)				1																
Helophorus griseus (Hbst.)						1														
H. brevipalpis (Bedel)											1									

1934, and March, 1935. The increased frequency of cleaning reduced the number of insects in the fountain, but it should be noted that only a very rough indication of the total population is given by the total catch; the collector tended to spend less time collecting on cold days and collecting was more difficult when the absence of sun made the bottom difficult to see. The first collection contained many more Corixids, but they flew from the bowls in which they were placed.

The following conclusions may be drawn:—

1. More frequent cleaning has almost exterminated the beetle population.

2. Corixids, on the other hand, recolonise the fountain fairly rapidly; their only means of access is *via* the air.

3. The composition of the Corixid fauna has changed, though it is not possible to conclude from the existing data whether this is to be correlated with the changes in the dissolved substances in the water or the more frequent cleaning.

4. Six species of Corixid must be frequently on the wing in Cambridge. It is noteworthy that these six represent the common Corixid fauna of Cambridgeshire with the exception of three river-inhabiting species, *S. striata* (Linn.), *S. falleni* (Fieb.) and *S. fossarum* (Leach). The occurrence of *S. selecta* is unexpected, as this species is usually found in salt marshes and other brackish habitats.

Conclusion. The observations described suggest that flight from one locality to another is of common occurrence in Corixidae, and that it is not confined to a small number of species. It is, therefore, interesting to note that each species appears to have a well-defined optimum habitat (Macan, 1938).

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NOTES ON *LAMPRONIA TENUICORNIS* STT. (Lep., Tin.).

By Wm. Fassnidge, M.A., F.R.E.S.

Since the winter of 1936-37 I have devoted much time to searching for the galls of this rare Tineid (see 1937, *Ent. Rec.*, **49**: 17-18). Last winter I had no success whatever, but this winter of 1938-39 at last brought me enough knowledge and experience to enable me to state here some definite conclusions reached. The favourite habitat appears to be young birches that are sheltered, but not thickly grouped together, in woods. Only very rarely does the gall occur higher than six feet and usually from three to five feet from the ground. Bushes about four years old seem to be most favoured, though I have found galls in the lower twigs of much older trees. Twigs of all sizes from one-eighth to half an inch in diameter may yield the gall, though a preference seems to be shown for twigs rather less than a quarter of an inch thick. The larva is very subject to parasitism. Old galls from which the moth has emerged soon become very inconspicuous owing to growth of the twig. Finally the female shows a decided preference for ovipositing in two adjacent nodes of the same twig, and I have once found three galls at adjacent nodes, all showing the completed exit hole. More rarely two larvae may be found at the same node, mining in the same gall, but each makes a separate exit hole almost side by side.

My observations lead me to believe that the moth is by no means rare in the woods around Southampton, though it is very rarely captured on the wing. The larva is fully grown by the end of the year, and when the winter ends it prepares its exit hole, spins a tough whitish cocoon inside the gall, and changes to a pupa towards the end of April. At that time proof of the presence of a larva or pupa is provided by the exit hole, which is sealed by a silken web, covered on the outside with coarse grains of reddish-brown frass. Parasitised larvae fail to complete this exit hole. Emergence takes place after the manner of a clearwing moth, the pupa projecting from the gall, held firmly by the anal segments. The galls were kept in a cold outhouse, where the first insect emerged on 29th April, some ten days before another made its appearance. Most of the moths emerged during the first fortnight in May, though Meyrick gives June as the date of emergence.

In all my experience I have found no gall-making lepidopteron more difficult to find than this one, owing to the small size and inconspicuous nature of the gall, to the innumerable swellings and thickenings of the birch twigs due to other causes, and most of all to the vast number of suitable bushes that must be patiently looked over.

IRISH TRICHOPTERA RECORDS.

By Bryan P. Beirne, B.Sc.

The following species of Trichoptera, collected in Ireland during the past few years, were very kindly identified for me by Mr. M. E. Mosely, F.R.E.S. One species, *Halesus digitatus* Schrk., has not previously been recorded from Ireland. All the species from Seapoint were taken at light in a moth-trap :—

Limnophilidae.—*Glyphotaelius pellucidus* Retz. : Seapoint, Co. Dublin. *Limnophilus flavicornis* F. : Cahirnane, Killarney. *L. lunatus* Curt.: Seapoint. *L. vittatus* F.: Seapoint. *L. auricula* Curt. : Seapoint ; upper lake and Cahirnane, Killarney. *L. hirsutus* Pict. : Seapoint. *L. luridus* Curt. : Seapoint. *L. sparsus* Curt.: Seapoint ; Kilmaeanogue marsh, Co. Wicklow. *Stenophylax permistus* McL. : Seapoint. *Micropterna sequax* McL.: Seapoint. *Halesus digitatus* Schrk.: Seapoint.

Sericostomatidae. — *Lepidostoma hirtum* F. : Ballyhooly, Co. Cork ; Tara Hill, Co. Wexford ; Enniskerry, Co. Wicklow.

Odontoceridae.—*Odontocerum albicorne* Scop. : Enniskerry.

Leptoceridae.—*Leptocerus aterrimus* Steph.: Kil o' the Grange and Finglas, Co. Dublin. *L. cinereus* Curt. : Ballyhooly. *L. albifrons* L. : Flesk, Killarney ; Ballyhooly. *L. dissimilis* Steph.: Ballyhooly. *Mystacides azurea* L.: Flesk, Killarney ; Ballyhooly. (?) *Adicella reducta* McL.: Quill, Co. Wicklow.

Hydropsychidae.—*Hydropsyche* (*Cheumatopsyche*) *lepida* Pict.: Ballyhooly. *H. instabilis* Curt. : Ballyhooly.

Polycentropidae.—*Polycentropus flavomaculatus* Pict. : Dunsink, Co. Dublin ; Courtown, Co. Wexford ; Ballyhooly. *Holocentropus picicornis* Steph.: Dunsink. *Cyrnus trimaculatus* Curt. : Ballyhooly.

Psychomidae. — *Tinodes waeneri* L. : Seapoint. *Psychomyia pusilla* F. : Enniskerry ; Ballyhooly.

Rhyacophilidae.—*Rhyacophila dorsalis* Curt. : Ballyhooly and Castletownroche, Co. Cork.

Hydroptilidae.—*Hydroptila forcipata* Etn.: Quill, Co. Wicklow.

AN ADDITION TO THE LIST OF BRITISH EPHEMEROPTERA.

By D. E. Kimmins

(Dept. of Entomology, British Museum, Nat. Hist.).

It is about eight years since a definite addition was made to the number of British species of Ephemeroptera. This was *Siphlonurus linneanus* Etn., which was recorded in 1931. Now

amongst a collection made in South Hampshire by Mr. T. T. Macan, of the Freshwater Biological Association, I have found a small series of a *Paraleptophlebia* which is neither *submarginata* nor *cincta*. The specimens were bred from nymphs collected in the River Allen, near Fordingbridge, and the River Till, the dates of emergence ranging from the 5th to the 19th May, 1939.

In appearance, the adults resemble *P. cincta* but are a little larger and more dusky. The wings of both sexes are somewhat smoky and the translucent abdominal segments of the male are definitely obscured with pale brownish, not white, as is normal in *P. cincta*. The base of the forceps of the male is less widely excised and the penis more deeply excised, the apices of the lobes terminating in slender, sinuous, divergent processes. The ventral surface bears two pairs of spines, directed basally and downward. The outer pair are nearly straight and about twice as long as the inner pair, which are more curved in side view. On the inner surface of each lobe, near the base of the excision, is a small triangular projection. The long basal segment of the forceps is distinctly inflated shortly before midway.

Two European species have been described having two pairs of spines on the lower surface of the penis, *P. werneri* Ulmer from Lower Austria and *P. tumida* Bengtsson from Northern

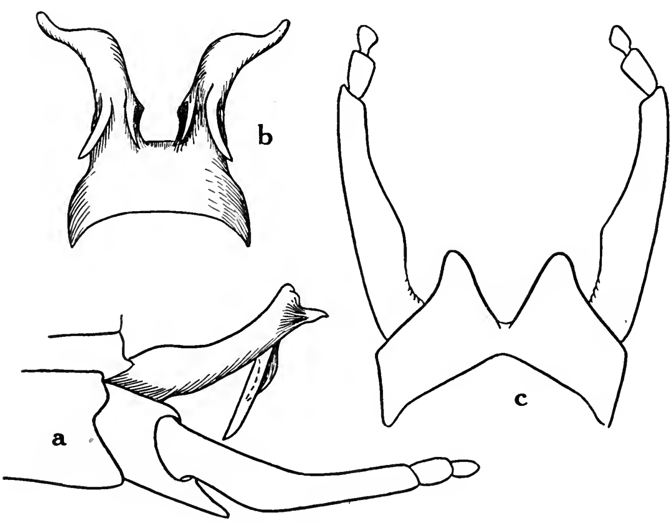

Fig. 1.—*Paraleptophlebia tumida* Bengtss. ♂, Hampshire.
a, Ninth sternite, penis, forceps base and forceps, lateral.
b, Penis lobes, ventral.
c, Forceps base and forceps, ventral.

Norway. The Hampshire specimens most resemble *P. tumida*, and I do not consider the differences are sufficient to warrant the erection of a new species. One would expect some differences between specimens from such widely separated localities, and most of the differences are paralleled in examples of *P. cincta* from various localities.

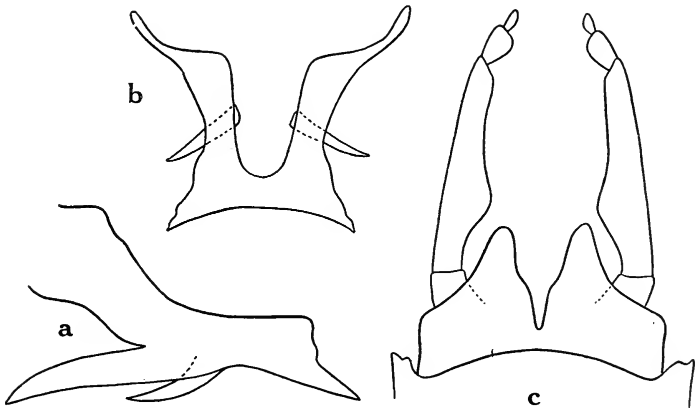

FIG. 2.—*Paraleptophlebia tumida* Bengtss. ♂ (after Bengtsson).
a, Penis lobes, lateral (more enlarged than b and c).
b, Penis lobes, dorsal, inner spines not shown.
c, Ninth sternite, forceps base and forceps, ventral.

The chief differences are: Somewhat larger, 7-8 mm. against 5-6 mm. in the Norwegian examples; thorax pitch-black instead of yellowish-brown; abdominal segments 4-6 in male pale brown instead of whitish with darker femora; and some variation in the proportions of the parts of the genitalia.

To assist in the recognition of this addition to the British list, I am figuring the genitalia of one of the Hampshire specimens and also reproducing Bengtsson's figures of the typical form, as these were published in a paper not readily accessible to British workers. I believe the joint at the base of the forceps is more in the nature of a crease than a true joint. For the purposes of comparison I am also figuring the genitalia of the other British species of *Paraleptophlebia*, *submarginata* (Stephens) and *cincta* (Brauer).

REFERENCE.

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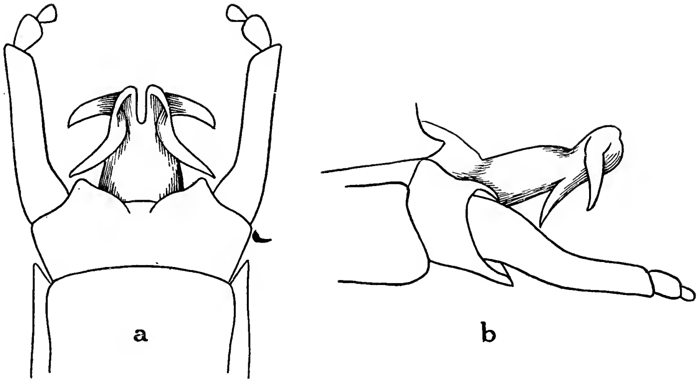

FIG. 3.—*P. submarginata* (Steph.) ♂.
a, Ninth sternite, forceps base and forceps, ventral.
b, The same, lateral.

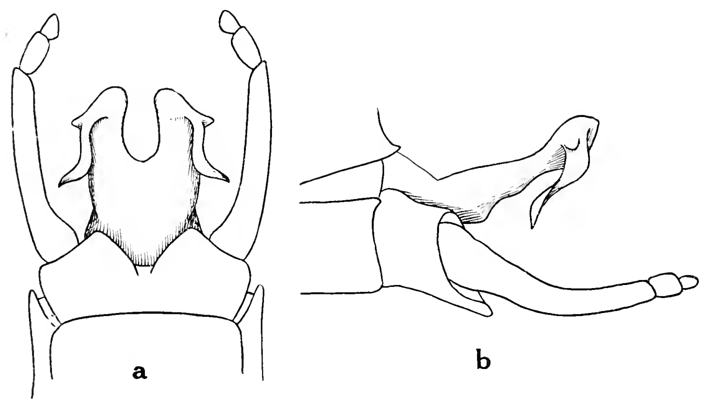

FIG. 4.—*P. cincta* (Brauer) ♂.
a, Ninth sternite, forceps base and forceps, ventral.
b, The same, lateral.

NOTES ON SOME NEUROPTERA FROM BUCKINGHAMSHIRE AND HERTFORDSHIRE.

By D. E. KIMMINS
(British Museum (Nat. Hist.), Dept. of Entomology.)

Early this month (July, 1938) Mr. R. B. Benson brought me some examples of *Nathanica capitata* (F.) from Brickhill, Bucks.

The species was taken on two occasions, 21st June and 8th July, and occurred in some numbers on pines, from which it was dislodged by beating. I believe this is the first record of the occurrence of *N. capitata* in Buckinghamshire.

Mr. Benson has also taken two females of *N. capitata* at Chipperfield, Herts, on the 14th July. Both these examples carried on the abdominal tergites a hardened whitish mass (? spermatophore) and one of them laid a number of eggs on the following day. On the same occasion four other species of Neuroptera were taken, *Chrysopa albolineata* Killington, *Sympherobius fuscescens* (Wallengren), *Hemerobius stigma* Stephens and *Wesmaelius quadrifasciatus* (Reuter); all four are new to the Hertfordshire list. Although *N. capitata* is not new to Herts, the specimens taken by Mr. Benson appear to be the first records since Stephens, a matter of over a century ago.

NEUROPTERA, MEGALOPTERA AND MECOPTERA FROM KENT AND SUSSEX.

By D. E. Kimmins

(British Museum (Nat. Hist.), Dept. of Entomology.)

The following records of Neuroptera in the Tunbridge Wells district were sent to me for publication by the collector, Mr. Roy A. Crowson, B.Sc., Municipal Museum, Tunbridge Wells.

The specimens are in the Tunbridge Wells Museum:—

Megaloptera.

Raphidia notata F. Ashour Wood, near Tonbridge, Kent, 24.v.38.

Neuroptera.

Osmylus fulvicephalus Scop. Larvae under stone by stream in deep wooded gulley near Tunbridge Wells, 11.xi.38.

Chrysopa carnea Steph. Ashour Wood, 31.viii.38; Tunbridge Wells Common, 6.ix.38.

Hemerobius stigma Steph. On *Pinus*, Broadwater Forest, Sussex, 31.iv.39.

Kimminsia betulina Strøm. On Oak, near Tunbridge Wells, 25.viii.38.

Eumicromus paganus L. Ashour Wood, 24.v.38.

Micromus variegatus F. On *Pteris*, near Tunbridge Wells, 24.viii.38.

Mecoptera.

Boreus hyemalis L. Adults in Mereworth Woods, Kent, 8.ii.39.

RELATIONSHIP BETWEEN AQUATIC INSECT LARVAE AND THE FOOD OF FRESH WATER FISH.

By H. P. Moon, M.A.
(Fisheries Laboratory, University College, Southampton.)

At first sight there may seem very little connection between entomology and the ecology of fresh water fish. It was thought, therefore, that the following example might be of interest to entomologists working in other branches of the subject.

During an investigation in the Fisheries Laboratory in Southampton on the food of fish, and the food of those organisms on which the fish themselves feed, the following observation was made. The stomachs of a stone loach (*Nemachilus barbatula*) and of a salmon parr (*Salmo salar*) were found to contain numerous heads of an Orthocladian midge larva. This larva is exceedingly common in the summer on the surfaces of stones in the River Avon (Hants) in places where the salmon parr and stone loaches occur. When the gut contents of the Orthocladian larvae are examined, it is found that their food is predominately diatomaceous, the guts being packed with these plants. One has, therefore, a case where a fly larva is playing an important part in the food-chain by converting the organic matter of the diatoms into a form suitable for consumption by fish.

Careful investigation shows that the majority of aquatic insect nymphs and larvae are dependent on either algal or diatomaceous food or on organic detritus. It is well known how important the immature stages of aquatic insects are for fish food, so that one has a relationship between microscopic plant life on the one hand and fish on the other, the connecting link between the two being largely formed by insects, although it should not be forgotten that the non-insect fauna of fresh waters plays its part.

A CONTRIBUTION TO THE BIOLOGY AND DISTRIBUTION IN GREAT BRITAIN OF *BOREUS HYEMALIS* (L.) (Mecopt., Boreidae).

By Edward W. Aubrook
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The life-history of *Boreus hyemalis* (L.) has been worked out by Brauer (1855, 1857, 1863) and by Withycombe (1922A). Brauer (1855) figures the first instar larva, the pairing of the adults and the female ovipositing; also the female pupa (1857)

and the mature larva (1863). The present paper deals mainly with biological observations made during the years 1934-37, and collates the known British localities for this insect.

I wish to express my thanks to Dr. R. Hanitsch for generous help in translating works in the German language; Prof. G. D. Hale Carpenter for facilities in the Hope Department of Entomology; Messrs. G. E. J. Nixon and A. W. Stelfox for the identification of the parasite; Prof. Balfour-Browne, Messrs. H. Britten, H. L. Burrows, Dr. W. J. Fordham, Messrs. H. Main and C. Morley for records; and Dr. B. M. Hobby for reading the manuscript. Records not otherwise acknowledged have been made by myself.

The Process of Copulation.

The pairing of *Boreus* has been described by Brauer (1855), Withycombe (1926), Syms (1934) and Steiner (1937). The two latter authors describe a use of the claspers of the male which I have noticed a number of times.

In one instance a male and female were seen with their bodies end to end, that of the male underneath that of the female. The ovipositor of the latter was over the hypopygium of the male. His claspers were gripping her hind femur, and he turned round, struggling a little, so that his body was at right angles to hers. Then his wings were placed over the basal segments of her abdomen, after which the two separated.

In another case the two insects were seen close together with their bodies at right angles, the male on the left side of the female. He had gripped the femur of her left hind leg with his claspers. The female ran a short distance occasionally, and once the male released his hold; the claspers could be seen waving about in the air until a fresh grip was obtained. He raised himself until his body was vertical and resting on the side of her abdomen near the base. The femur was again freed, and the claspers took hold near the coxae of the right middle and hind legs. After staying in this position for a short time the pair separated and the next stage was not witnessed. Comparing this account with those of Withycombe and Syms, it seems probable that in the normal course of events the male obtains a grip of the basal segments of the body of the female with his wings, relaxes his claspers and, with them, forces down the valves below the ovipositor and inserts his aedeagus. A pair were seen in which the wings of the male were over the female's abdomen, and union had taken place. The body of the female was thus slung obliquely across that of the male. He raised his wings, and her body assumed a more or less upright position supported on his hypopygium, gradually settling down to the normal position. After union has been effected, the antennae are deflected backwards, and her middle and hind

femora are drawn up close to the body; the body is slightly curved, and the rostrum is usually held tightly between the wings of the male. The front femora of the female are held downwards, diverging from the body, and inclining backwards, so that the tarsi pass on each side towards the apex of the body of the male. Both polygamy and polyandry were observed, and one pair of individuals copulated four times. The copulation period lasted for several hours, occasionally over a day, and once for between two and three days.

Withycombe (1922A) observes that apparently little use is made of the ovipositor during egg-laying, as eggs which he obtained were laid at the bases of the moss plants. Brauer (1855) noticed the females with their ovipositors buried in the earth, and a figure of a female about to assume this attitude is given by him (Tab. III, f. 6). Three times during the present observations females were seen with their bodies almost vertical and their ovipositors completely buried in the soil. No eggs, however, were found when the earth at these places was examined later.

THE PARASITE *DYSCOLETES LANCIFER* HAL.

On 14th April, 1935, two white legless Hymenopterous larvae, 4·5 mm. long, were found in moss in company with larvae of *Boreus* at Marsden Clough, Yorkshire. One of the larvae carried, about half-way down its dorsum, a skin of a *Boreus* larva, having just completed emerging from this. The skin had a vertical slit in the head capsule in the occipital region, which was continued along the dorsal area of the prothoracic segment. The parasitic larvae failed to pupate. Two similar larvae were taken in the Goyt Valley, Cheshire, on 10th April, 1936, and subsequently three emerged from *Boreus* larvae collected there. Of these, two pupated on the surface of the moss, producing male and female pupae, the latter having a long ovipositor. Another parasitic larva which emerged on 2nd May, 1936, spun a yellow cylindrical cocoon, 4·5 mm. long. The pupae were attacked by fungus in a short time, and were preserved in spirit. The cocoon was opened on 16th June, and the pupa inside was found to have been partially eaten away. A similar cocoon was found in moss collected at Bradenham, Bucks, on 6th June, 1936, and from this a male Braconid emerged on 9th July. This Braconid was the same species as one bred by Mr. G. Nixon in September, 1929, from Hayes, Kent, and was kindly identified by Mr. A. W. Stelfox as *Dyscoletes lancifer* Hal. Two parasitic larvae were found at Naphill on 11th April, 1937, and one emerged from a larva collected at Bradenham on the same day. Male *D. lancifer* emerged from moss containing *Boreus* larvae, from Bradenham, on 17th May

and 15th June, 1937, and females from moss from Naphill on 24th May and 5th June, 1937. Morley (*in litt.*) possesses 'one female, bred from the moss that contained larvae of *Boreus* at Reigate during July, 1916.'

The Occurrence of partially-grown Larvae in Summer.

Whilst collecting larvae and pupae of *Boreus* during the latter part of the summer, it is common to find two sizes of the former. Withycombe (1922) first noticed this when he found three larvae, the smallest 2 mm. long and the largest 2·5 mm., on 21st September, 1921. Syms (1934) and Main (*in litt.*) also found small larvae in the month of August, and from these bred adults in the autumn of the following year. Three larvae 2·5 mm. long were observed at Holker, Lancashire, on 5th September, 1935. On 20th October, 1935, in the Goyt Valley, Cheshire, eight small larvae were collected. A number of larvae 2-2·5 mm. long were taken at Bradenham, Buckinghamshire, on 8th August, 1936, together with mature larvae, and on 29th November, 1936, larvae 3-4 mm. long were found in the same locality. Larvae about 4 mm. long were found commonly at Chinnor, Oxfordshire, on 12th December, together with one 2 mm. long. About six larvae 2 mm. long were received from Mr. H. Main on 12th October, and further specimens 4 mm. long were received on 22nd November, 1936. A small quantity of moss was collected in the Goyt Valley in October, 1934, and kept in the laboratory until 20th April, 1935, when it was broken up. A number of small *Boreus* larvae and a white male pupa were found in it. The pupa became yellowish on 8th May, and the adult emerged on 15th May. It lived until the 21st and did not completely attain the bronze colour of the mature insects.

On 20th June, 1937, at Naphill, Bucks, numbers of nearly full-grown larvae were found. In addition three larvae, 1·5 mm. long, were taken from an area of moss about twelve inches square. It seems probable that a few adult *Boreus* may appear during May, though no pupae have been found in the field at any time of the year except in the autumn. The desirability of frequent field observations during the spring is indicated.

The Distribution in Great Britain.

Trail (1885) took two males and one female near Aberdeen in November, 1884. On the latest date for adults in Britain which has come to our notice, 5th April, 1895, Willis (1895) found a female *Boreus* amongst several insects on the snow at Clova, Forfarshire, between 'the hotel and Loch Wharral, at 1,500-2,000 feet,' in the same note McLachlan making an observation on the influence of latitude and altitude on the emergence from the pupal state.

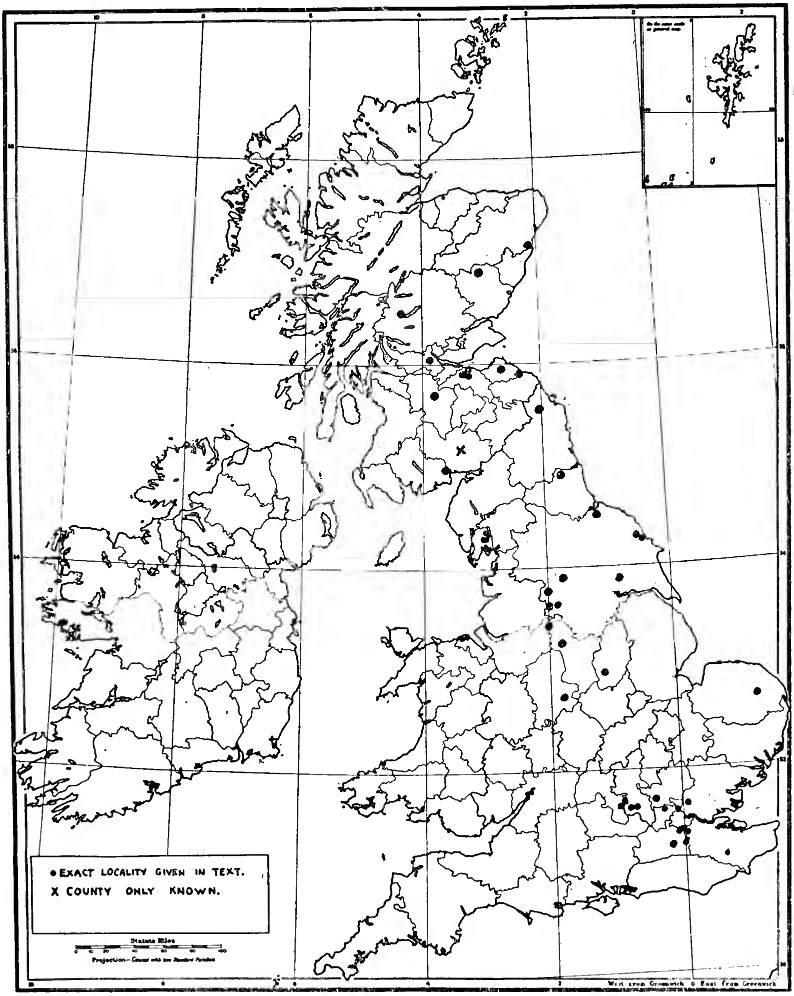

FIG. 5.—*Boreus hyemalis* (L.), distribution in British Isles.

King (1885) records the species as not uncommon on a moss-covered wall in Glen Lochay, near Killin, mid-Perthshire, on 23rd October, 1884. Blair (1932) found a larva during the latter half of June under moss on a boulder at Killin.

Evans (1897, 1898, 1900, 1914) records the insect from the following numerous localities: in 1903 at Glen Burn at the foot of West Lomond Hill, Fife, and in 1913 at Presmennan, East

Lothian, at the foot of the Lammermuir Hills. In 1896 at Flotterston Bridge, near Glencorse, 20th October; roadside at Morton, 21st October; Dreghorn, 22nd October; Comiston, 24th October; Swanston, 28th October; Boghall, 9th November; Lothianburn, 24th November. He notes that these latter localities are at or near the base of the eastern spur of the Pentland Hills. In 1897 it occurred to him on the banks of Water of Leith below Harper-rig Reservoir, in the western section of Edinburgh (10th November), and at Mountlothian, between Penicuik and the Moorfoot Hills, in the southern section (22nd November). On 2nd December, 1899, he captured a female in Braidwood Glen, near Carluke, Lanarkshire, the first record of the species for the Clyde area.

Carpenter (1895) received a female amongst some spiders which he received from Mr. W. Evans, collected at Morton, about two miles south of Edinburgh, in November and December, 1894.

Dr. C. B. Crampton obtained a number, some emerging from the pupal condition, at Torwood, East Stirlingshire, in October, 1907. Three *Boreus* from Torwood are now in the collection of the Manchester Museum.

Writing from Penmanshiel, near Cockburnspath, Berwickshire, Hardy (1848) records the finding of a single specimen in a tuft of *Trichostomum aciculare* P. Beauv. [*Rhacomitrium aciculare* Brid], growing on a stone wall, in a wood 'near this place.' He notes that it emitted a scent somewhat resembling that of *Panorpa*. In 1885 he says: '. . . Although not very common in this part of Berwickshire, I have found it in former years during the winter and early spring crawling on wall-tops or among rocks, or shaken from moss or grass. Among the Cheviots I have seen it among mosses on the porphyry rocks behind Wooler . . . I have also seen it in spring among moss or rocks in Old Cambus dean.'

Sharp (1895) figures a female from Dumfriesshire, and states that he has met with the species under stones in March.

Prof. Balfour-Browne, about 1893, captured a single example in Dalskairth Wood, Kirkcudbrightshire.

Harrison (1915) records *Boreus* from Birtley, Durham, and from Eston Moor, Yorkshire. Also in Yorkshire, Walsh (1921, 1923) met with the species on Hay Brow, Scalby, on 6th November, 1920, and in the snow at Oliver's Mount during the winter of 1922. Cheetham (1921A) describes capturing a single specimen at the foot of Smearsett. Fordham (1930 and *in litt.*) collected *Boreus* on Allerthorpe Common on 21st November, 1929, in *Polytrichum* and on 27th November, 1932. *Boreus* occurred to L. E. Gallagher between Otley and Shipley on 21st January, 1934. At Greenfield, in the West Riding, numerous

specimens were collected on 11th November, 1934, and at Hebden Bridge a male was found on a small patch of moss on a dead birch on 6th January, 1935. Larvae were taken commonly in moss at Marsden Clough on 14th April, 1935.

On 7th May, 1935, Mr. H. Britten, senr., received from Miss A. J. Major some plants which were packed in moss collected at Cunsey, Windermere. Larvae of *Boreus* were found when this moss was broken up. During the early part of September, 1935, larvae were taken in North Lancashire at Hampsfell, Grange-over-Sands, near Lakeside, Windermere, and Holker.

Mr. H. Britten, junr., collected a few specimens of *Boreus* on the Derbyshire and Cheshire sides of the Goyt Valley during the autumn of 1933. On 20th October, 1934, in company with Mr. H. L. Burrows, in the same locality, about a dozen insects were captured. Two of these were yellowish-green, indicating their recent emergence. Specimens emerged subsequently from a patch of moss collected on this date and transferred to the laboratory. On 4th November, 1934, *Boreus* was taken commonly in the same locality, when pairing was observed. A larva was found at Cressbrook, Monsal Dale, Derbyshire, on 27th December, 1936.

Stephens (1835) refers to the occurrence of *Boreus* 'last winter, in the vicinity of Nottingham, by R. Bakewell, Esq., to whom I am indebted for specimens.'

Numerous specimens were taken at Burnt Wood, Staffordshire, by Mr. Burrows on two visits in October and November, 1934.

The first record in England is apparently that of Dr. Leach at Costessy, Norfolk, given by Curtis (1826).

Boreus larvae were collected at Aston Rowant, Oxfordshire, on 8th August, 1936, and at Chinnor, Oxfordshire, on 12th December, 1936. Larvae, pupae and adults have been found on several occasions at Bradenham, Buckinghamshire.

Lucas (1910, 1928, 1929, 1930) gives a number of records of Mecoptera, from which the following relating to *Boreus* are taken. Blair took larvae in September, 1927, at Naphill, Buckinghamshire, and on 5th November, 1927, found larvae and pupae at Stanmore Common, Middlesex. Syms took all three stages on 5th November, 1927, at Epping Forest. Kimmins found larvae at Hayes, Kent, on 19th October, 1928, a pupa at Hosey Common on 26th October, and adults at Epping Forest and at Limpsfield Chart, Surrey, during November.

Morley (1910) mentions a specimen in his collection, taken by Mr. Albert Pifford at Felden, Boxmoor, Hertfordshire, some years previously.

Curtis (1826) states: 'Last November and January, Mr. Henry and Mr. Francis Walker found four or five specimens secreted in the moss in a plantation at Southgate.'

Douglas (1867) captured both sexes at Shirley, near Croydon, Surrey, on 3rd November, 1867, on moss under furze bushes, and Scott also took a female at West Wickham, Kent.

Boreus has apparently been collected at two localities only in Wales. On 1st September, 1936, a pupa was found in moss at Bluebell Woods, near Prestatyn, and on 2nd September, 1936, a larva was taken at Gwaenysgor, Flintshire.

There are thus existing records of *Boreus* from ten Scottish, one Welsh and fifteen English counties, the latter situated north of a line drawn from Rhyl, Flintshire, to Eastbourne, Sussex. As far as can be ascertained, there is no note of the species from the mid- and south-western counties of England, or from Ireland.

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INSECTS BRED FROM STUMPS OF *SALIX VIMINALIS* L.

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In 1936 I was anxious to have specimens of *Cryptorrhynchus lapathi* L. (willow weevil) for disease transmission work in connection with the watermark disease of the cricket bat willow. Dr. H. F. Barnes kindly provided a number of old stumps of *Salix viminalis* L. collected by him at Batford, near Harpenden,

Herts, which produced the following insects:—

(1) *Cryptorrhynchus lapathi* L. (Col., Curculionidae). Eight specimens; emerged 28th May—7th June, 1936. Some of these weevils lived for a considerable time, one living for more than eight weeks after leaving the stumps and feeding voraciously on green willow shoots.

(2) *Aegeria* (*Sesia*) *formicaeformis* Esp. (Lep., Aegeriidae). Fourteen specimens; emerged 10th—30th June, 1936.

Both *C. lapathi* and *A. formicaeformis* (red-tipped clearwing moth) are well-known pests of willows, damaging the rods as well as living in the stumps.

In 1937 I collected further stumps of *S. viminalis* from the same locality, which produced a number of specimens of *C. lapathi* but no specimens of *A. formicaeformis*. The following insect, however, was obtained:—

(3) *Solenius continuus* (Lep.) (*vagus* L.) (Hym., Crabronidae). 1 ♂, 3 ♀♀; emerged 7th June, 1937.

This species has been frequently recorded as building its nests in rotten wood and provisioning them with various Diptera.

The following Hymenopterous parasites were also obtained from the stumps collected by Dr. Barnes:—

(4) *Meniscus frontalis* Desv. (Hym., Ichneumonidae).
3 ♂♂; emerged 10th—20th June, 1936.
6 ♀♀; emerged 23rd June—14th July, 1936.
One male and one female have been retained in the collection at the British Museum (Natural History).

(5) *Rhogas irregularis* Nees (Hym., Braconidae).
1 ♀; emerged 20th June, 1936.

It is extremely probable that both *M. frontalis* and *R. irregularis* were parasites of *A. formicaeformis*.

I wish to thank Dr. O. W. Richards for the determination of *Solenius continuus* and Mr. J. F. Perkins for the determination of *Meniscus frontalis* and *Rhogas irregularis*.

THREE RECORDS OF LEPIDOPTERA IN NORFOLK, 1938.

By A. H. Turner, F.R.Met.Soc., F.Z.S.

Trochilium apiforme Clerck. turned up in a new locality at Boughton, near Stoke Ferry, in June.

Polygonia c-album Linn. Six specimens have been seen in the East Dereham district between June and October.

Colias croceus Fourc. (= *edusa* Fabr.). Four males were seen together at Swanton Morley on 4th August, and one male at Whissonsett on 10th August.

ACRYDIUM SUBULATUM Linn. (Orth.) IN NORFOLK.

By A. H. Turner, F.R.Met.Soc., F.Z.S.

Specimens of this grasshopper were taken in 1937 on the burnt-out remains of garden bonfires at Wendling. It has occurred again in 1938 in similar situations. It is remarkable how they persist in congregating on these blackened patches where fires have been burning.

Dr. Malcolm Burr (1936, British Grasshoppers and their Allies, London) does not include Norfolk as a home of this species.

A FEW ANTS TAKEN IN DERBYSHIRE.

By B. D. W. Morley.

In April of last year (1938) I was able to spend a few days collecting in Derbyshire. The area in which I collected was that round Dovedale and Matlock. I did, however, get a chance to collect, or rather to attempt to collect, near the famous 'Cat and Fiddle,' but I saw no sign of any ants on the top of the pass. The following is a complete list of all the species taken:—

**Myrmica laevinodis* Nyl.—Heights of Abraham, Matlock.

**Myrmica ruginodis* Nyl.—Heights of Abraham, Matlock, and also Dovedale.

**Myrmica sulcinodis* Nyl.—High Tor, Matlock; Dovedale.

**Myrmica scabrinodis* Nyl. var. *sabuleti* Meinert.—Heights of Abraham, Matlock.

Acanthomyops (*Donisthorpea*) *niger* L.—Specimen seen, but not actually taken.

Acanthomyops (*Chthonolasius*) *flavus* F.—High Tor, Matlock; Dovedale.

**Acanthomyops* (*Chthonolasius*) *mixtus* Nyl.—Heights of Abraham, Matlock; Dovedale.

Formica fusca L.—Heights of Abraham, Matlock.

Of the ants in the above list, five of the species (marked with *) have not, as far as I know, been recorded from Derbyshire, and the remaining species are widely spread over the whole of England, though *Acanthomyops niger* seems almost unbelievably rare in that district. *Acanthomyops mixtus*, on the other hand, is very common in Dovedale, and fairly so around Matlock. It seems surprising that *Myrmica scabrinodis* Nyl. was not taken, as the country collected over was typical *Myrmica* country,[1] but the failure to take the three remaining species

[1] Morley, B. D. W. 1938. Some interesting observations on ants' nests in the Bath (N. Somerset) district. *Ent. Rec.*, **50** : 35.

recorded from Derbyshire, *F. rufa, Ac. fuliginosus* and *L. acerorum,* is accounted for by the open ground over which I collected. *M. ruginodis* and *M. sulcinodis* were very common on the Heights of Abraham, but only one colony of *M. laevinodis* was found there, and it was here that the solitary specimen of *Ac. niger* was seen and lost. *F. fusca* was abundant, if local, and *Ac. flavus* was common, there being a very fine colony of about a thousand nests on the corner of 'Thorpe Cloud,' Dovedale.

A list of twelve species is very poor for such a locality as this, and I do not doubt that many more could be listed if the district were worked thoroughly, preferably by some local entomologist who could give much time to it; at the moment few myrmecologists have touched it. I suggest that all the British Myrmicas with the exception of *schenki,* all the British *Acanthomyops* with the exception of *brunneus* and *umbratus* var. *affino-umbratus,* and all the British Formicas with the exception of *picea* and possibly *rufibarbis,* could be found there, together with *T. caespitum, Formicoxenus nitidulus* and *Myrmecina gramanicola.*

THE DISAPPEARANCE OF *FORMICA PRATENSIS* RETZ AND *FORMICA EXECTA* NYL. (Hym., Formic.), FROM BOURNEMOUTH.

By B. D. W. Morley.

In the pine woods in or on the outskirts of Bournemouth many nests of *Formica rufa* L. are to be found, but it is very rarely that one finds a nest of *Formica pratensis* Retz, while, to-day, it is impossible to find a nest of *Formica execta* Nyl. Yet these two ants used to be the common wood ants of Bournemouth. *F. execta* was the first one to disappear entirely from the district (though it can still be taken in the New Forest), and *pratensis* seems to be following it, for it is now extremely rare in Bournemouth. The reason for the disappearance of these two ants from the district immediately surrounding Bournemouth appears to be due to the invasion of *F. rufa,* which, living as they do in large polycalic colonies, have a great advantage over the *F. execta* and *F. pratensis,* which are usually found in solitary nests in Britain, though abroad *F. execta,* at any rate, forms large polycalic colonies. Bournemouth used to be regarded as one of the best localities for the scarce British *F. execta,* and it is a great pity that it has disappeared from here, as it is one of our most interesting ants. I should mention that I have not taken it in Bournemouth during the last seven years.

AESHNA MIXTA LATR. (Odonata).

By S. E. Hall.

Considerable interest has been taken in the distribution of this species, and Dr. F. J. Killington's investigations in 1929 (*Trans. Ent. Soc. Hamps. S. Engl.*, **5**: 71-4) added considerably to the hitherto scanty records of W. J. Lucas.

It is commonly agreed that it has a very local occurrence, but I consider it to be one of the most difficult dragonflies to capture, and perhaps for this reason *A. mixta* has not been so frequently recorded as that of the other species of Odonata.

My own captures are as follows:—

September,	1918.	On the banks of the Arun, just outside Arundel Park Walls (1 male, 1 female).
,,	1936.	Bodian Castle Moat (2 males); Appledore, Kent, on the Hythe Canal (1 male).
,,	1937.	Ditto (4 males).
,,	1938.	Ditto (2 males).
,,	1938.	Ham Street, Hythe Canal (1 male).

I visited the same spot on the Arun again in September, 1938, after an interval of twenty years, and saw several *A. mixta* both on the river bank and *per colla* over a pond just inside the walls of Arundel Park, and it would certainly appear that this species is now more firmly established at this particular spot than it was in 1918.

I have attempted this year to obtain larvae, but so far without success.

It may be of additional interest if I add that at this same spot on the banks of the Arun I made the following captures of *Gomphus vulgatissimus* (Linn.):—

18.vi.1914. Three males.
8.vii.1918. One female.

CRIORRHINA RANUNCULI PANZ. (Dipt., Syrphidae) IN DORSET.

By P. Harwood, F.R.E.S.

I took about a dozen *Criorrhina ranunculi* Panz., 15th-18th April, 1938, at flowers of the common laurel in a large wood near Crichel, Dorset.

TWO WATER BUGS NEW TO GREAT BRITAIN: *MICROVELIA PYGMAEA* DUF. & *MICROVELIA UMBRICOLA* WROB. (Hemipt.).

By G. A. Walton.

Introduction.

During a holiday at Barton Broad, Norfolk, in August, 1934, a few specimens of a *Microvelia* were observed which differed from my conception of *Microvelia reticulata* Burmeister, then the only known British species. Being at the time more interested in water beetles than water bugs, a camera lucida drawing was made of a male and the specimens were lost.

On 19th April, 1937, a large number of surface sweepings were gathered from the swampy margin of Little Sea, Studland Heath, Dorset, and taken to Bristol for examination. From this material a single female *Microvelia* was obtained which also differed from *M. reticulata,* but it corresponded perfectly with a female of *M. pygmaea* Duf. from the south of France received through the kindness of Prof. R. Poisson, of Rennes. Were the Norfolk examples also *M. pygmaea?* A male from Studland for comparison with the camera lucida drawing would solve this. On 5th August I again collected round Little Sea, and after a search lasting ten hours discovered a colony of *M. pygmaea,* but the males did not agree with the drawing. A visit to Norfolk was not possible until 5th to 7th August, 1938, when the local form was found in abundance. This was obviously another species, but it remained to prove that it differed from any of the species described from Africa or the Near East, since *M. pygmaea* is found as far south as Senegal. While engaged in this task and preparing descriptions and figures, I received an excellent paper from Dr. Alexander Wroblewski, of Poznan, Poland, giving descriptions and figures of this very same insect, which he called *Microvelia umbricola.* There are, therefore, three British species of *Microvelia,* namely *M. reticulata* Burmeister, *M. pygmaea* Dufour and *M. umbricola* Wroblewski.

Ecology.

M. reticulata Burm.

This is a very common insect in England and Ireland, inhabiting a wide variety of still or sluggish water habitats, provided they are of a stable nature and have shelter all the year round, the most suitable being those surrounded by trees and/or beds of the reed *Phragmites communis.* In Wales the species is not common, but I found it in great numbers on a small lake near Bangor, Caernarvonshire, where *Salix* bog with *Sphagnum*

suddenly gave place to deep clear water. The only Scottish record is by T. M. McGregor and G. W. Kirkaldy for Perth.

M. pygmaea Duf.

This species was found on Little Sea where *Ulex* heath on Bagshot Bed formation rises abruptly from the water's edge to the north-west to a height of 20 feet. In every other direction the habitat is surrounded after 200 feet of water by rolling sand dunes and is open to the sunshine, getting over 1,800 hours annually. This snug habitat is further sheltered by scattered clumps of marginal *Salix* bushes which have formed shallow shade pools amongst the swamp in which they grow; on these the *Microvelia pygmaea* are to be found. These pools are only about 4-5 inches deep, and *Phragmites*, 7 feet high, grows thinly through most of them, with *Juncus communis* E. Mey., mixed with *Myrica gale* L. and *Molinia coerulea* Moench around the margin, and occasional *Sphagnum, Ranunculus Flammula* L., *Hydrocotyle vulgaris* L. and *Rubus* to the landward side. On the lakeward side these little pools give way to swamp vegetation containing thick *Hypericum elodes* Huds. and *Sphagnum*, from which grow *Phragmites, Scirpus tabernaemontani* Gmel., *Mentha aquatica* L. and *Lycopus europaeus* L. The *Microvelia pygmaea* were not numerous, but were the only macroscopic animals except occasional *Gyrinus caspius* Mén. in the more shaded pools. Where there was more light *Microvelia reticulata* Burm. gradually replaced the *M. pygmaea* Duf., and the following animals appeared: Hemiptera—*Naeogeus ruficeps* Thoms., *Salda cincta* H. Schff., *Notonecta glauca* L., *Nepa cinerea* L., *Corixa castanea* Thoms.; Coleoptera—*Haliplus ruficollis* Degeer, *Hygrotus inaequalis* Fab., *Hydrovatus clypealis* Sharp; Arachnida—*Argyroneta aquatica* Cl.

M. umbricola Wrob.

In 1934 this species was found on an old ditch deep in the swamp not far from the staithe or landing-place in the Broad. This ditch is about 6 feet wide and is full of black flocculent mud to within a few inches of the surface, and is shaded by *Salix* trees which line the bank in an irregular manner. The surrounding swamp is quite firm and is thickly overgrown with vegetation dominated by *Phragmites, Menyanthes, Rubus* and *Ranunculus Flammula* L. The low peaty banks of this ditch bear a thick growth of *Carex pseudocyperus* L. and some *Juncus effusus* L., which hang over, dipping into the water and forming a dank and dingy tunnel against the bank. Here a few specimens of the *M. umbricola* were found, but further along the ditch where there was more light, and everywhere else in the swamps, *M. reticulata* abounded. Other inhabitants

of this gloomy *Carex* tunnel were *Hydrometra gracilenta* Horv., itself new to Britain (see Walton, G. A., 1938, *Ent. mon. Mag.*, **74**: 272-5, figs.), *Salda cincta* H. Schff., Collembola, numerous spiders and mosquitoes.

In 1938 *M. umbricola* had extended its range considerably: on the ditch above it was numerous and there were no *M. reticulata*; it was dominant along about a quarter of a mile of swamp south of the staithe, occurring in the ditches and inlets around the staithe and in greatest abundance in an old disused boathouse. Everywhere else *M. reticulata* took its place. The vegetation in the outskirts of its territory includes *Scirpus lacustris* L., *Nymphaea alba* L., *Nuphar luteum* Sm., *Hydrocharis morsus-ranae* L., *Stratiotes aloides* L., *Sparganium simplex* Huds., *Mentha aquatica* L., *Sagittaria sagittifolia* L., *Typha*, *Potentilla palustris* Scop. and *Menyanthes*.

Systematics.

Since there has been some confusion over the nomenclature of these species the following synopsis has been included in the paper.

Monsieur Léon Dufour was the first to describe a species belonging to this genus (1833, *Ann. Soc. ent Fr.*, **2**: 115, Pl. 6, f. B1) as follows :—

'*Velia Pygmaea* . . . Nigro-cinerea, thoracis margine antico tenuiter, antennis pedibusque basi rufo-testaceis; linea orbitali interna maculisque sex in singulo hemelytra albis; thorace rhomboideo, convexiusulco, in medio levissime carinato, angulis lateralibus prominulis; hemelytris fumosis abdominis longitudine; pedibus inermibus subaequalibus, tarsis anticis uni articulatus, reliquis biarticulatis. Hab. in aquis stagnantibus, umbrosis, circa Saint-Sever (Landes). Long. $\frac{2}{3}$ lin.'

In his figure he shows the segments of the posterior tarsi almost equal in length, which is not true of either *M. reticulata* or *M. umbricola*. In the following year Westwood suggested the name *Microvelia* for the little species *M. pygmaea*, further to distinguish it from *Velia currens* Fab. (1834, *Ann. Soc. ent. Fr.*, **3**: 647). The next year, H. Burmeister (1835, Handbuch der Entomologie, **2**: 213) described another species, but under another generic name, *Hydroëssa reticulata*. 'Fusca, antennarum basi pedibusque pallidis, elytris fuscis, areolis albohyalinus. Long. $\frac{1}{2}'''$.'

A. H. Haliday was the first to discover the genus in Great Britain, near Belfast, in 1838 (see J. Curtis, 1838, *Brit. Ent.*, **15**: 681, Tab. 681, who describes it as *Hydroëssa pygmaea*!). H. Scholtz in 1847, Prodromus zu einer Rhynchoten-Fauna von Schlesien, *Uebers. Arb. schles. Ges.*, **1846**: 102, described a species under the name *Hydroëssa schneideri*:—

'Langlich=eiformig, sammetschwarz; Basis der Fuhler bisweilen gelblich; gelblich ferner die Unterflache des Kopfes, der Anfang des Saugruffels und die erste Halfte der ziemlich schlanken und schwach gekrummten Schenkel. Silberweiss sind 2 schmale Striemen langs des oberen Augenrandes, 2 kleine Querflecken am Vorderrande des Thorax, 4 rundliche Flecke und 2 schmale Wische auf jeder Flugeldecke. Der Thorax zeigt ausser einem Mittelkiel auch noch Andeutungen zweier Seitenkiele; Seitenecken des Thorax ziemlich stark hervortretend. Lange $\frac{3}{4}$ Linien.

'Bei uns sehr haufig auf Lemna und Nymphaen blattern in stehenden Wassen, z. B. im hiesigen botanischen Garten, am Kratzbusch u. a. O.'

G. W. Kirkaldy (1899, *Entomologist,* **32**: 113, Tab. I, figs. 12-13) maintained that Westwood mentioned *Microvelia* only as a subgenus or section, so that the name was invalid and *Hydroëssa* took precedence, but this is not generally accepted. In 1916, G. Horvàth (*Ann. hist.-nat. Mus. hung.,* **14**: 68) analysed the situation, pointing out that there were really two European species, a larger more southern species called *M. pygmaea* (Duf.) and a smaller northern species, *M. reticulata* Burm., 1835, and correctly made *M. schneideri* (Scholtz, 1847) a synonym of *M. reticulata*. This news was spread in Great Britain by E. A. Butler (1918, *Ent. mon. Mag.,* **54**: 212-3), so that all records of *Microvelia* in this country were automatically changed from *M. pygmaea* to *M. reticulata* when in reality both were present in England because an unrecognised specimen of *M. pygmaea* had been collected in the New Forest two years before Horvàth wrote his paper. The following is a list of the more important synonyms.

M. pygmaea Dufour.

Velia pygmaea Dufour, Ann. Soc. ent. Fr., **2**: 115, pl. 6, fig. B1 (1833).
Hydroëssa pygmaea Fieber, Eur. Hemipt.: 104 (1861).
Microvelia pygmaea Puton, Syn. Hem. France, **1**: 149 (1879).
Microvelia pygmaea Horvàth, Ann. hist.-nat. Mus. hung., **14**: 69 (1916).
Microvelia pygmaea Butler, Ent. mon. Mag., **54**: 212-13 (1918).
Microvelia pygmaea Jaczewski, Ann. Mus. zool. polon., **11**: 197-99, figs. 22-26 (1936).
Microvelia pygmaea Wroblewski, Ann. Mus. zool. polon., **13**: 215 (1938).
Microvelia nilicola Costa, Atti Accad. Sci. fis. mat. Napoli, **7**: 17 (1875).
Microvelia gracillima Jaczewski, Ann. Mus. zool. polon., **5**: 70-1, figs. 11-12, pl. 2, fig. 2 (1926).

M. reticulata Burm.

Hydroëssa reticulata Burmeister, Handb. Ent., **2** (1): 213 (1835).
Microvelia reticulata Horvàth, Ann. hist.-nat. Mus. hung., **14**: 69 (1916).
Microvelia reticulata Butler, Ent. mon. Mag., **54**: 212 (1918).
Microvelia reticulata Butler, Biol. Brit. Hem.-Het.: 238 (1923).
Microvelia reticulata Jaczewski, Ann. Mus. zool. polon., **11**: 197-99, figs. 22-26 (1926).

Hydroëssa pygmaea Curtis, Brit. Ent., **15**: 681, pl. 681 (1838).
Hydroëssa pygmaea Flor, Rhynch. Livl., **1**: 749 (1860).
Microvelia pygmaea Douglas and Scott, Brit. Hem., **1**: 574, pl. 19, fig. 3 (1865).
Hydroëssa pygmaea Thomson, Opusc. ent., Hem. fasc., **4**: 394 (1871).
Microvelia pygmaea Saunders, Trans. ent. Soc. Lond., **1876**: 640 (1876).
Microvelia pygmaea Horvàth, Term. Fuz., **2**: 131, pl. 6, fig. 2 (1878).
Microvelia pygmaea Vollenhoven, Hem. Neerland.: 336, pl. 19, fig. 10 (1878).
Microvelia pygmaea Saunders, Hem. Brit. Isl.: 150, pl. 13, fig. 10 (1892).
Hydroëssa pygmaea Kirkaldy, Entomologist, **32**: 113, pl. 1, figs. 12-13 (1898).
Microvelia pygmaea Guerin et Peneau, Faun. Ent. Armor. Hém. I. Gerrid.: 7, 5 (1911).
Microvelia pygmaea Lundblad, Ent. Tidsk., **36**: pl. 196, figs. 2-3 (1915).
Hydroëssa schneideri Scholtz, Uebers. Arb. schles. Ges., **1846**: 102 (1847).
Hydroëssa schneideri Fieber, Eur. Hemipt.: p. 105 (1861).
Microvelia schneideri Sahlberg, Medd. Soc. Faun. Flor. Fenn., **1**: 89 (1876).
Microvelia schneideri Puton, Syn. Hem. France, **1**: 149 (1879).
Microvelia schneideri Reuter, Ent. Tidskr., **3**: 167 (1882).
Microvelia schneideri Guerin et Peneau, Faun. Ent. Armor. Hém. I. Gerrid.: 7, 5 (1911).
Microvelia schneideri Jordan, Z. wiss. InsektBiol., **27**: 18-22 (1932).
Microvelia schneideri Wroblewski, Ann. Mus. zool. polon., **13**: 215 (1938).
Microvelia schneideri Wroblewski, Frag. Faun. Mus. zool. polon., **4**: 6 and 7 (1939).

In the collections of British collectors the following specimens of *M. pygmaea* passed as *M. reticulata* :—

Butler collection in British Museum, two apterous females, New Forest, 1925. In Mr. P. Harwood's collection, two apterous females; one, Studland, Dorset, 11/9/37; one, New Forest, 30/5/1914! In the collection of Mr. E. C. Bedwell, one apterous female from Little Sea, Studland Heath, Dorset, 11/9/37.

Comparison of the Species.

There are now five species of minute surface water bugs in Britain: two species of *Hebrus* Curtis, one of which is dimorphic, and three of *Microvelia,* from which they are distinguished by having five-segmented antennae and ocelli instead of four segments and no ocelli. All the *Microvelia* species are dimorphic, and with the sexual dimorphism there are twelve different forms needing discrimination. The following brief descriptions in conjunction with the drawings should make the position clear.

Microvelia reticulata Burmeister (1835).

Hydroëssa reticulata Burmeister, Handb. Ent., **2** (1): 213.

Apterous form. Male. Length 1·4 mm. Shape oblong-oval, breadth $\frac{2}{5}$ of the length. Colour brownish-black. Pronotal collar replaced by transverse brownish line. Posterior margin of pronotum and mesonotum in a smooth curve parallel to one another. Breadth of abdomen $\frac{2}{3}$ of the length, blunt. First, second and third tergites with a small patch of silver pubescence near each lateral margin. Seventh tergite with central shiny

patch. Eighth segment just visible from above as tiny semicircle. First segment of hind tarsus $\frac{1}{2}$ of the length of the second (the same in all four forms of the same species).

Apterous form. Female. Length 1·6 mm. Shape oval. Colour black. Pronotal collar of silver pubescence interrupted in middle, posterior margin as in the male. Each connexival segment bears a large rectangular patch of silver pubescence which spreads to the tergites, especially the first, second, third, sixth and seventh, giving the insect typical reticulated appearance. Eighth segment deeply sunk into seventh segment.

Macropterous form. Male. Length 1·65 mm. Humeral angles of dark brown, pentagonal, pronotum about 90°, rather sharply rounded, anterior margins slightly concave, collar of silver pubescence poorly developed. Hemelytra with two furcate yellowish-brown marks at base, the outer more pronounced than the inner; recurved yellowish-brown mark near the centre with a faint brown blotch external to it and a brown blotch at the apex and a small pale brown mark on the membrane.

Macropterous form. Female. Length 1·85 mm. As in the male, but pronotal collar of silver pubescence wider. Markings on hemelytra larger, whiter and more distinct, inner basal mark longer than outer, the apical mark oval and conspicuous.

Apterous form common and widely distributed in England and Ireland, scarce in Wales and Scotland. Macropterous form is not common, but usually occurs in small numbers wherever the apterous form is abundant. Outside Britain the range is doubtful owing to past confusion with *M. pygmaea* and the introduction of *M. umbricola*. France, Poland, Germany and Scandinavia.

Microvelia umbricola Wroblewski, 1938.

Microvelia umbricola Wroblewski, Ann. Mus. Zoo. Polonici, **13**: 215.

Apterous form. Male. Length 1·7 mm. Shape elongate, breadth $\frac{1}{3}$ of the length. Colour black. Pronotal collar brown. Posterior margin of pronotum sinuated in middle, posterior margin of mesonotum thrice sinuated. Breadth of the abdomen $\frac{1}{2}$ of the length, tapering. First and second tergites with small lateral patches of silver pubescence. Fifth, sixth and seventh tergites shiny black with minute lateral patches of silver pubescence. Eighth segment a small oblong against the narrowly truncated apex of abdomen and ninth a tiny black semicircle surmounting this. Connexivum black. First segment of posterior tarsus $\frac{1}{2}$ of the length of the second.

Apterous form. Female. Length 1·75 mm. Shape oval. Colour black. Pronotal collar faintly grey, posterior margin of pronotum slightly concave, mesonotum parallel to pronotum. All connexival segments except first and last dull black; these have small silver pubescent patches. Lateral borders of all tergites

bear silver pubescent patches, first and second conspicuous, others small. Fifth, sixth and seventh tergites shiny black. Eighth segment deeply sunk into seventh segment. Ninth visible as tiny black semicircular projection.

Macropterous form. Male. Length 1·95 mm. Shape intermediate between winged forms of *M. reticulata* and *M. pygmaea.* Pronotal collar of silver pubescence poorly developed and interrupted in middle; colour dark brown, anterior margin straight, humeral angles slightly truncated. Hemelytra with basal and central areoles suffused with brown, remainder brownish-black with distinct oval cream apical blotch.

Macropterous form. Female. Length 2·03 mm. Pronotum as in male. Outer basal hemelytral mark whitish and more pronounced than pale brown inner one, large conspicuous oval cream blotch in middle areole narrowly margined with brown, oval apical cream blotch also conspicuous.

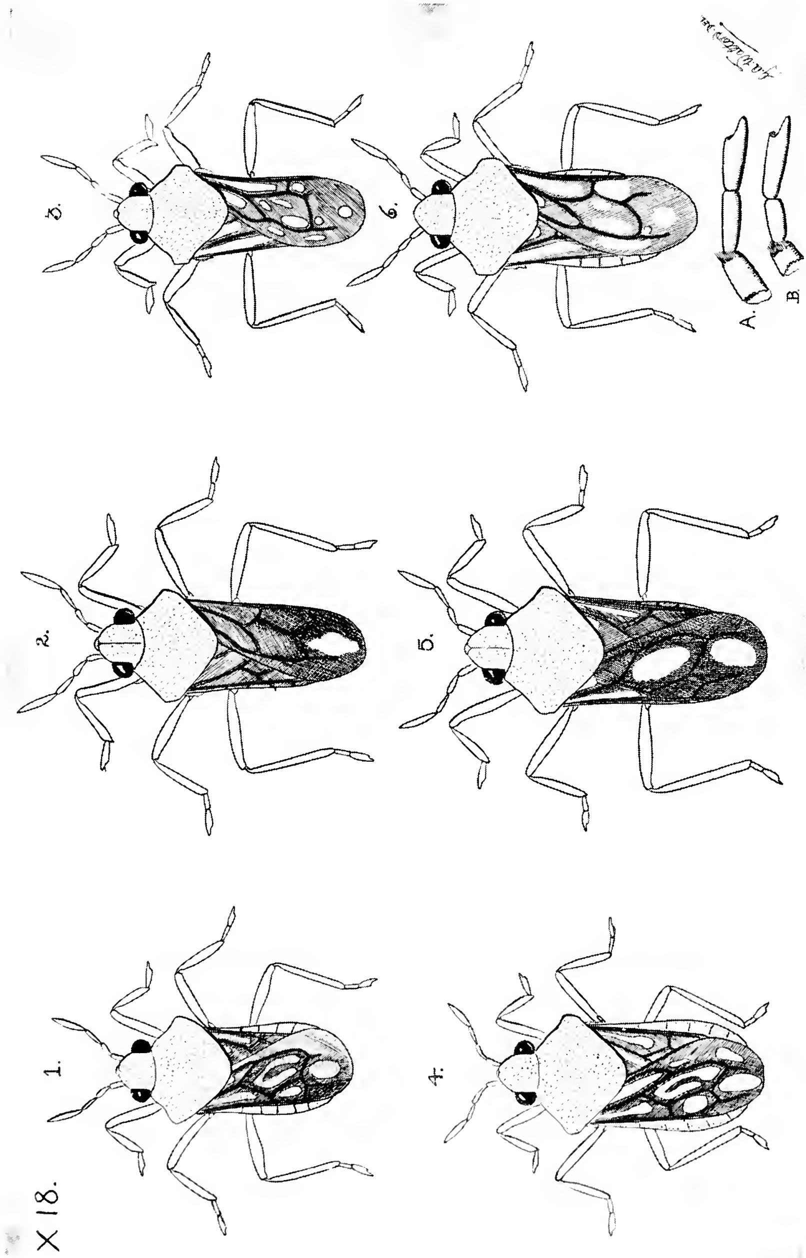
In Great Britain so far recorded only from Barton Broad, Norfolk. Outside Britain it has so far been found in fifteen localities in Poland, mostly round Posen (Poznan); it has also been found in S.E. Poland and near Hamburg in Germany. At Barton Broad only the apterous form was found, although many thousands must have been seen, and the macropterous form is so conspicuous. However, this summer (1939), I have bred a perfect macropterous female and also preserved two larvae which would have become macropterous. The descriptions of the winged form were made from examples kindly sent by Dr. Wroblewski from Poland before I bred the female example; the latter is almost identical with the Polish material.

Microvelia pygmaea Dufour (1833).

Velia Pygmaea Dufour, Ann. Soc. ent. Fr., 2: 115.

Apterous form. Male. Length 1·6 mm. Shape slightly more elongate than *M. reticulata.* Colour brown. Pronotal collar russet-brown interrupted in middle. Mesonotum entirely covered. Breadth of abdomen $\frac{2}{3}$ of the length, a little constricted towards the base and broadly truncated at the apex. First five connexival segments translucent brown. Last three tergites shiny black. First four tergites frosted at sides. Eighth segment very large and rectangular, with small semicircle of ninth segment visible at apex, often large curved right clasper also visible. First segment of posterior tarsus as long as the second.

Apterous form. Female. Length 1·8 mm. Shape elongate-oval. Colour brown and black. Pronotum covers mesonotum, collar of silver pubescence broad and interrupted in the middle. Abdomen constricted at base, widest at middle, tapering somewhat apically. All connexival segments translucent russet-brown margined anteriorly with black. Eighth abdominal segment semicircular, prominent, sunk shallowly into seventh.

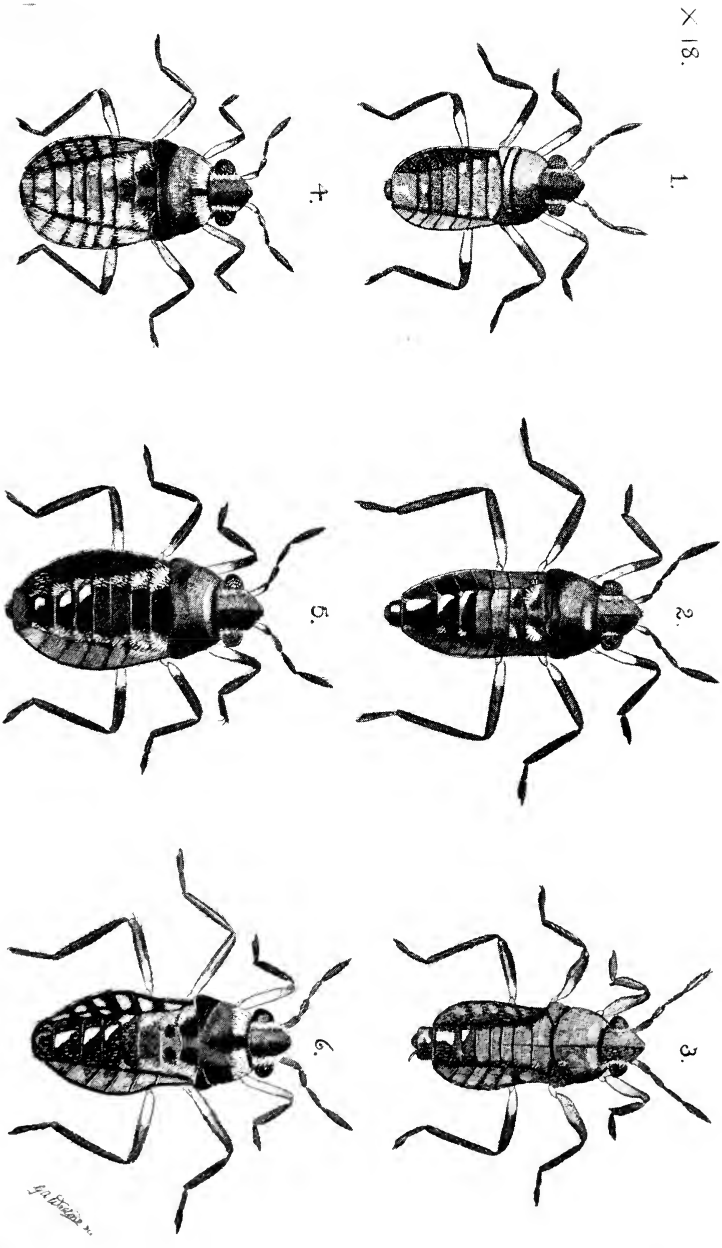


FIGS. 1—6. *Macropterous form.* (figurative representation).

1, *Microvelia reticulata* Burm., ♂; 2, *M. umbricola* Wrobl., ♂; 3, *M. pygmaea* Dufour, ♂; 4, *M. reticulata*, ♀; 5, *M. umbricola*, ♀; 6, *M. pygmaea*, ♀.

A, posterior tarsus of *M. pygmaea*; B, posterior tarsus of *M. umbricola* or *M.. reticulata*.

PLATE II.



FIGS. 1—6. *Apterous form.* (accurate reproductions).

1, *Microvelia reticulata* Burm., ♂; 2, *M. umbricola* Wrobl., ♂; 3, *M. pygmaea Dufour*, ♂; 4, *M. reticulata*, ♀; 5, *M. umbricola*, ♀; 6, *M. pygmaea*, ♀.

First three tergites with lateral patches of silver pubescence. Last four segments shiny black.

Macropterous form. Male. Length 1·8 mm. Pronotum dark grey with distinct longitudinal tapering black streak, lateral angles truncated, broad silver collar narrowly interrupted medially. Hemelytra dark grey, the outer basal streak white, longer than the inner. The central recurved blotch of *M. reticulata* broken up into two or three smaller silvery-white blotches; there is also a silvery-white inner and outer submarginal blotch. The apical blotch is a white dot.

Macropterous form. Female. Length 2·0 mm. Shape more elongate than female of *M. reticulata*; similar to male in form and colour except that the blotches are whiter.

In Great Britain so far recorded from Little Sea, near Studland, Dorset, and from Bratley Bog in the New Forest, Hampshire. The macropterous form has not yet been found in England in nature, but the writer has bred three winged males and two winged females from apterous examples obtained at Little Sea; it is from these that the descriptions and figures have been made. Outside Britain the range is uncertain owing to confusion with *M. reticulata*. Definitely South of France, Egypt, Senegal, ? Gold Coast.

FIFTH ANNUAL CONGRESS OF THE SOCIETY FOR BRITISH ENTOMOLOGY, MANCHESTER, 1939.

By C. J. Banks, B.Sc.

The Fifth Annual Congress of the Society was held in Manchester from 4th to 18th July, 1939, in collaboration with the Manchester Entomological Society. Professor W. A. F. Balfour-Browne, M.A., F.R.S.E., F.L.S., F.Z.S., F.R.E.S., F.S.B.E., was in the chair. Sixty entomologists attended the Congress.

Several members attended the first day's field meeting at Whixall and Fenn's Mosses, near Whitchurch, Shropshire, despite the inclement weather.

The proceedings on the following day were held at the University of Manchester. Professor J. S. B. Stopford, M.D., F.R.S., Vice-Chancellor of the University, bade all visitors a hearty welcome to Manchester. The President's address followed, his subject, 'From the Particular to the General—A Study of Water Beetles,' being an interesting and thorough exposition of the evolutionary tendencies and relations among these insects. Capt. T. Dannreuther's address on the migrations of *Colias croceus* Fourcr. and *C. hyale* L. concluded the

morning's programme. After luncheon, members spent the afternoon inspecting exhibits and collections in the Manchester Museum. Before tea, they assembled outside for the photograph to be taken. In the evening, Mr. H. N. Michaelis, President of the Manchester Entomological Society, addressed the Society on changes in the insect fauna in the Manchester district due to urbanisation. Later, members were received in the University Staff House by the Presidents of the Society for British Entomology and of the Manchester Entomological Society, and then assembled for dinner.

Sunday, 16th July, was devoted to an excursion to Delamere Forest. This was well attended, and the weather conditions were good for the greater part of the day.

Mr. H. P. Moon addressed the Congress on the following day on the subject of the food of aquatic insects. He was followed by Dr. M. Cohen, who spoke on his researches on leaf-mining Diptera. His address led to an eager discussion. In the afternoon, Mr. H. Britten gave an interesting and instructive account of many years' research on insects. The President concluded the proceedings, expressing his thanks to the Local Secretary, Mr. G. J. Kerrich, and to all those who had contributed towards the success of the Congress. It was announced that the Society again intended to hold a Congress in the North, and hoped to visit Newcastle-upon-Tyne in 1940.

Several members attended a post-congress meeting at the Freshwater Biological Association's laboratory, Wray Castle, Windermere. They arrived on the Monday evening, and were entertained by Mr. and Mrs. T. T. Macan. They heard on the following morning an address by Mr. Macan on the ecology of the Corixidae, and then dispersed to collect in the neighbourhood. Most visitors left for their homes in the afternoon, although some prolonged their stay for another night.

RECORDS OF CAPTURES OF *SIGARA GERMARI* FIEB. AND *CORIXA PANZERI* FIEB. (Hemiptera, Corixidae) IN HAMPSHIRE AND WILTSHIRE; WITH A NOTE ON THE EGGS OF *S. GERMARI*.

By C. J. Banks, B.Sc.

(Dept. of Zoology, University College, Southampton).

According to Butler (1923, p. 597), *Sigara germari* (Fieb.) is not known to occur in Hampshire and Wiltshire. This species seems to be restricted in its distribution to more northern counties. Butler gives Westmorland, Cambridge and Stafford, and adds that it has been found in Scotland and Ireland. Jones

(1928-30, p. 76) says, 'Chiefly a northern insect in Britain.' Macan (1939, p. 25) states that it is local in the north and west of the country, and that it is rare in the Lake District. As Butler (p. 596) points out, *S. germari* and *S. carinata* (C. Sahlb.) were for a long time confused under the name '*carinata*,' and therefore many of the existing records apply equally to one or both these species. This note should, therefore, have a double interest, in adding to the knowledge of the distribution of *S. germari,* and in recording it from two localities from the far south of these islands.

The first record is from a small pond near Alvediston, south Wiltshire. This pond is situated high up on a chalk down, and is one of the so-called 'dew ponds' characteristic of this district. On 12th April, 1938, two specimens, a male and a female, were taken in company with a large number of *S. lateralis* (Leach), a few *S. praesta* (Fieb.), *S. limitata* (Fieb.), *Corixa punctata* Illig., *Notonecta glauca* Linn. and *N. maculata* Fabr.

The second record is from Longcross Pond, Hampshire, situated close to the northern boundary of the New Forest, one and a half miles west of the village of Brook. On 16th April, 1939, one female specimen was captured, together with *S. distincta* (Fieb.), *S. limitata, S. lateralis* and *C. punctata.* The insect was taken back to the laboratory, and during the night 17th-18th April she laid eight eggs on the weed provided. The female died on the evening of the 18th. The eggs all proved to be fertile and hatched on 7th May, 1939.

The eggs of *S. germari* have never been described. They differ slightly in appearance from the usual Corixid egg, which is provided with a conspicuous peduncle and attachment disc posteriorly and is cemented around the edge of the disc to the

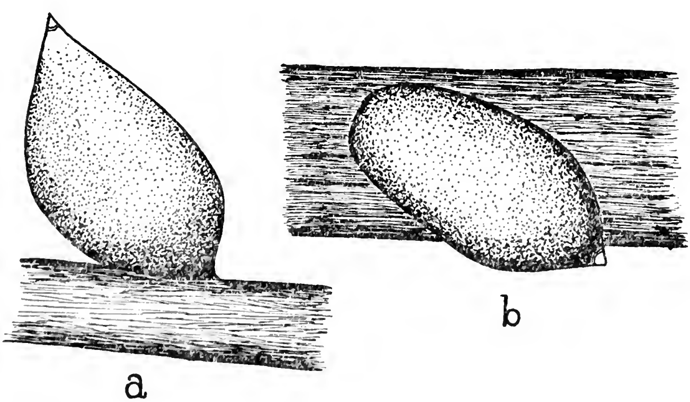


FIG. 6.—*Sigara germari* (Fieb.): a—egg seen from the side; b—seen from above.

substratum. In the egg of *S. germari,* however, there appears at first sight to be no peduncle or disc, but closer observation reveals that these structures are very small and are completely obscured by the brown cement. The eggs are relatively more elongate and asymmetrical than is usually the case in the Corixidae. The accompanying sketches (Fig. 6) illustrate the appearance of the newly-laid egg, and show how the long axis is inclined towards the surface of the substratum instead of being approximately at right angles to it. The more convex (future ventral) surface of the egg is nearer the substratum. Another feature of the eggs was their transparency, which allowed the developing embryos to be observed with ease. The greatest length of an egg was 0·7 mm. and the greatest width 0·5 mm.

Corixa panzeri Fieb. is likewise unrecorded for Hants. This species was for a long time confused with *C. affinis* Leach, and some of the existing records may perhaps refer to *C. panzeri.* Butler (p. 576) says that *C. panzeri* is certainly known from Essex, Kent, Sussex, Surrey, Cambridgeshire, Hertfordshire, Cheshire, Lancashire and the Orkney Islands, and (p. 577) *C. affinis* has certainly occurred in Kent, Sussex and Hampshire.

I have captured *C. panzeri* from several localities in south Hampshire, two from the immediate neighbourhood of Southampton, and three from the New Forest.

Swaythling, Southampton (disused reservoirs) - - - -	16.x.36 -	1 ♀.
	4.xii.36 -	1 ♀.
	15.iii.37 -	1 ♂, 3 ♀♀.
Fairoak (near Southampton) -	8.ii.37 -	1 ♀.
Longcross Pond (north New Forest)	23.xi.36 -	1 ♂.
Pond near Burley (south New Forest) - - - - -	20.x.36 -	1 ♀.

The insect seems to be widely but locally distributed in south Hampshire, although its numbers are few where it does occur.

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PLATE III.

Photo] [*D.E.K.*

Dissected flower of *O. elodes* showing fly (*E. praevia* Coll.) trapped on stigma.

Photo] [*D.E.K.*

O. elodes, showing position of fly (*Empis praevia* Coll.) in mouth of spur.

EMPIDIDAE (Dipt.) AND THE FLOWERS OF *ORCHIS ELODES* GODFERY.

By D. E. Kimmins.

It has been suggested to me that I should place on record the following observation, and I am doing so, though with some hesitation, since I am neither botanist nor dipterist. On 25th June, 1939, I was in the Broadmoor Valley, near the source of the River Tillingbourne on Leith Hill, Surrey, and in an area of boggy ground came upon a colony of *Orchis elodes*. The flowers were in some numbers and, having my camera with me, I took some photographs, and also collected some blooms to photograph at home, should those in the open prove unsuccessful. Next day, when examining them more closely, I noticed that many of the flowers had in the mouth of the spur a dead, small blackish fly, head downwards in the tube. My curiosity was aroused, and I took a couple of enlarged photographs, one from in front showing the hinder portion of the fly protruding, and the other of the same flower, partly dissected, showing the fly adhering by its wings to the sticky stigma (Plate III).

I extracted a number of specimens from two of the flower heads and showed them to Dr. F. W. Edwards, who told me that four species were present, three Empididae and a Chironomid. The majority of the specimens belonged to *Empis praevia* Coll., a species represented by two examples in the Museum collections, and considered scarce. Many of the specimens from the flowers were in poor condition, but Dr. Edwards told me that he had obtained four pairs for the collection. The other species represented were *Rhamphomyia umbripennis* Mg., *R. longipes* Mg. and the Chironomid, *Smithia trilobata* Edw.

Not being a botanist, I next enquired of Mr. A. J. Wilmott whether *O. elodes* was commonly affected thus, and he told me that in his experience it was definitely unusual, although he had seen a small black fly in one specimen this year. In some of the blooms I collected practically every flower had a fly trapped in it, only the upper, freshly opened specimens being free. The flies so trapped by the orchid are too small to be of service in pollination, and I should imagine that their presence on the stigma would be a definite hindrance to fertilisation.

Since my photographs were exhibited at the Society's 1939 Congress at Manchester by Dr. Edwards, I have had an opportunity of discussing the question of flies in orchids with a botanical friend, Mr. E. C. Wallace, who tells me that he had also observed small flies commonly in flowers of *O. elodes* in the same locality in 1926. He sent specimens to the Watson Botanical Exchange Club, and the following note appeared in Vol. III, No. 10, of their Reports (6. 399, 1927): 'This species

is abundant in wet peat bogs in Surrey and Sussex. I have rarely seen two specimens in which the lip-markings or the colouring were identical . . . Nearly every blossom had a little fly in the top of the spur, but when the flies were removed they were dead, or else intoxicated with nectar.' '

Mr. Wallace has also examined his sheets of orchids in his herbarium, and in addition to those from Broadmoor, 12.vi.26, he reports two flies in a specimen of *O. elodes* from Liphook, Sussex, 27.vi.37, and one in a specimen from Thursley, Surrey, 24.vi.33. He also found one fly in a specimen of *O. praetermissa* from Buckland, Surrey, 26.vi.31.

ORNITHOMYIA LAGOPODIS SHARP (Dipt.) TAKEN FROM A SANDPIPER.

By H. J. Moon, M.R.C.S. (Eng.), M.B.O.U.

On 17th June, 1932, I was trapping and ringing birds near Kirkby Lonsdale, Westmorland, and removed from a young common sandpiper (*Tringa hypoleucos*) a specimen of the grouse fly *Ornithomyia lagopodis* Sharp. I am indebted to Dr. F. W. Edwards, of the British Museum, for kindly naming the fly, and he mentions that, so far as he is aware, this is the first record of this parasite from the sandpiper.

An interesting point is that the young bird in question was netted while under water, and the grouse fly seemed quite indifferent to its submersion.

ACRONYCTA RUMICIS LINN. (Lep.) FEEDING ON *LUPINUS*.

By W. Parkinson Curtis, F.R.E.S.

In common with most people who have a garden, I have a number of plants of *Lupinus* hybrids of garden origin. I was surprised to find a full-grown larva of *Acronycta rumicis* feeding on this plant. It seems to be a very general feeder, but *Lupinus* is not of British origin.

MERULA MERULA LINN. ATTACKING *HEPIALUS LUPULINUS* LINN. (Lep.).

By W. Parkinson Curtis, F.R.E.S.

On 28th June, 1939, I witnessed in my garden a lively chase by a male blackbird of a male *H. lupulinus* Linn. As everyone knows, the flight of *lupulinus* is erratic and rapid, and I was surprised that a rather heavy flier like *M. merula* could display sufficient dexterity of flight to capture this insect. However, notwithstanding the insect took a mazy course through a well-planted border, the bird followed and caught it and swallowed it whole, wings and all, whilst still itself in flight.

PASSER DOMESTICUS LINN. ATTACKING *AGROTIS PRONUBA* LINN (Lep.).

By W. Parkinson Curtis, F.R.E.S.

On 18th July, 1939, in my garden I watched a male sparrow drive a specimen of *Agrotis pronuba* Linn. out of a thicket of Sweet Williams and capture it on the wing. It first seized the insect by the right forewing, which tore with the usual characteristic V-shaped beak-mark, and the insect took refuge in a trellis covered by a climbing rose of a variety with particularly large thorns. Nothing daunted, the sparrow hunted the insect out again and succeeded in getting a grip on both left wings. It proceeded to beat the insect on a flagged path till it severed both wings from the thorax. It then detached the legs severally, seized the insect by the head, and beat it on the path till the head came off. This it ate and then beat the insect till it had caused a gaping wound in the abdomen. It proceeded to empty the abdomen and thorax and finally to eat the exterior chitinous skeleton by pulling it apart and swallowing the pieces. The performance occupied about ten minutes. I examined the débris and found that the only parts not eaten were the wings. An examination of these showed that they were so much injured that one would have had some difficulty in guessing the identity of the enemy if one had not observed the attack.

NOTES ON THE REARING OF *SYMPETRUM STRIOLATUM* (CHARP.) (Odon.).

By S. E. Hall.

In Lucas's The Aquatic (Naiad) Stage of the British Dragonflies (Paraneuroptera) (Ray Society, 1930, p. 81) there is an account of the rearing of this species from the egg by Miss D. Molesworth in 1912, which extended over a period of forty-five weeks from the date of the hatching of the eggs. Throughout the winter, which was a mild one, the aquarium containing the naiads was standing on a window-sill, the window being open day and night. I was anxious to see if, by keeping the naiads away from an open window and supplying them continuously with ample food, I could improve upon the foregoing period.

So on the 22nd September, 1938, I obtained several eggs and kept them in various vessels on the mantelpiece in an unheated room, the window being open the greater part of the day but closed at night. The eggs began to hatch on the following 8th November (nearly seven weeks after being laid, as against five weeks in Miss Molesworth's experiment). The growing naiads were regularly fed with *Paramecium,* but by the new year only four naiads were alive. Each was then placed in a tumbler of water and was soon eating *Daphnia pulex* Lamarck, with which they were always well supplied.

In the middle of March these tumblers were transferred to an unheated greenhouse, which seemed to suit the naiads, as they steadily increased in size and eventually were fed on Enchytraeidae (pot worms). Growth then continued so rapidly that I placed the four naiads together in a small aquarium, 12 ins. long, 7 ins. broad and 6 ins. in depth, and on the 1st July placed small twigs therein.

On the 7th July two climbed out of the water and emerged, a third followed in a day or two, and the fourth naiad emerged on the 13th of the month, so that the period covered from the date of hatching of the eggs was only thirty-five weeks.

The temperature in the greenhouse ran very high in April, May and June, and no doubt conduced to an early emergence, aided, I am inclined to think, by the Enchytraeidae, which may possibly have been more nourishing than *Chironomus* larvae.

THREE PAIRINGS BETWEEN *EPHESTIA ELUTELLA* HB. and *BORKHAUSENIA PSEUDOSPRETELLA* STT. (Lep.), ONE A *COPULA INTER MARES.*

By Joseph L. Williams.

(University of Pennsylvania and Lincoln University, Pa.)

At Southampton on 6th July, 1939, Mr. Wm. Fassnidge noticed in a breeding cage, where last year's old breeding material was stored in expectation of emergences after two years in pupa, a pairing between *Ephestia elutella* Hb. and *Borkhausenia pseudospretella* Stt. The latter species is a common pest in such situations, while of the former about a dozen specimens were present. On 11th July at 9 a.m. two similar pairs were found in the same box. All three pairs were handed over to me for examination and dissection.

In the case of the pair received on 6th July, the *elutella* was dead when I received it, and the *pseudospretella* was dragging it round the box. I made a dissection of both and found male internal genitalia in *pseudospretella* and nothing in the abdomen of *elutella* except the bursa containing a large spermatophore extending from the penis of *pseudospretella*. The presence of the bursa (Plate IV, Fig. A) shows that the *elutella* was a female.

Of the two living pairs received on 11th July, *elutella* of one pair died at 5.15 p.m. of the same day, after which I made a dissection of both still joined together, and was surprised to find male genitalia in both individuals. Plate IV, Fig. B, shows the testes of *pseudospretella* and the male reproductive organs of *elutella*. The spermatophore issuing from the penis of *pseudospretella* had pushed the internal organs of *elutella* to one side, and the external genitalia encircled the posterior por-

PLATE IV.

Mixed pairings between *Ephestia elutella* Hb. and *Borkhausenia pseudospretella* Stt. The insects shown in Fig. B are males.

FIG. A.—Upper arrow indicates the bursa copulatrix of *elutella* expanded with the spermatophore of *pseudospretella*. Lower arrow indicates part of the male internal genitalia of *pseudospretella*.

FIG. B.—Upper arrow indicates the testes of *pseudospretella*. Lower arrow indicates part of the male internal genitalia of *elutella*. Note the antennal difference of the two species.

tion of the abdomen of *elutella*. A sharp crescent-shaped structure had made a hole in the sternite of the *Ephestia* at the approximate position of the opening of the bursa copulatrix in a female, and the penis of the *Borkhausenia* was inserted into this opening, while the penis of the *Ephestia* was extended a little beyond the posterior end of its abdomen. It would appear that *elutella* male was the victim of *pseudospretella,* since this pairing seems to be an aggressive act on the part of the latter species. The spermatophore dislocates the internal organs of the male *elutella* and causes death, while its large head prevents the pair from separating.

In the case of the third pair the *pseudospretella* was dead on the morning of 15th July, and I immediately killed the *elutella* and made a dissection. They were still joined together. Dissection showed *pseudospretella* male and *elutella* female. The ovaries were well preserved and filled with eggs. The bursa copulatrix was as shown in Plate IV, Fig. A. We have looked for mixed pairings of *pseudospretella* female and *elutella* male, or of *elutella* male copulating with the male of *pseudospretella,* but so far have found none.

REVIEW: A KEY TO THE BRITISH SPECIES OF CORIXIDAE (Hemiptera-Heteroptera) WITH NOTES ON THEIR DISTRIBUTION. By T. T. Macan, M.A., F.R.E.S. Pp. 27. With 22 text-figures. 8vo. Published by the Freshwater Biological Association of the British Empire, Wray Castle, Ambleside, Westmorland. 1939. Price 1s. 6d.

By C. J. Banks, B.Sc.

This work is the first of a series of scientific publications which the F.B.A. has decided to publish on particular groups of aquatic animals. Their main object is to provide simple keys for the identification of species, and they will be devoted in the first place to those groups which have received inadequate attention in the past.

The author of this pamphlet has provided freshwater biologists with a very satisfactory key to this family of Hemiptera. The introduction includes information on the position of the family, general remarks on the use of the key and the characters used in identification, brief remarks on structure, followed by hints on killing and preserving Corixids. The key itself is divided into three sub-keys: the first is to the subfamilies, the second to the genera, and the last to the species. All the species of Corixidae known to these islands are included. The characters

chosen for the key are those which may easily be discovered, and the few technical terms used are explained in the introduction. The author has dispensed with detailed descriptions of the structure of the insects, and has saved space and trouble to the reader by providing him with a number of simple sketches. A special and very useful feature is the way in which contrasting characters are portrayed by groups of these illustrations. Full references to the sketches are made in the key. In his sketches of the hemielytra, Mr. Macan has brought out the essentials. The faint markings so characteristic of the hemielytra of *Sigara lateralis* Leach, to take one example, are admirably reproduced. It is unfortunate that the figures of the male palae on p. 18 are not drawn to the same scale, although the legend states that the magnification is × 27. The series of male right genital forceps in Fig. 22 provides a means of easy reference.

Besides the key, the author has given ecological notes on the species of British Corixidae. Types of habitat are first listed, followed by notes on the habitats of individual species. This section forms a novel and valuable addition to the key. A list of the relevant literature concludes the publication.

The title on the cover, as given above, does not agree with that on p. 2, which reads, 'A key to the British species of Corixidae (Hemiptera Heteroptera) with notes on their ecology.'

REVIEW: THE BRITISH CADDIS FLIES (Trichoptera). A COLLECTOR'S HANDBOOK. By Martin E. Mosely, F.R.E.S., F.Z.S. Pp. xiii + 320, 4 plates, 631 text-figs. Published by George Routledge and Sons, Ltd., London. March, 1939. Price 21/-.

By Fredk. J. Killington, D.Sc., A.L.S., F.R.E.S.

The study of the Trichoptera of the British Isles has been retarded for many years by the lack of a work enabling collectors to identify their captures. McLachlan's classic work, 'A Monographic Revision and Synopsis of the Trichoptera of the European Fauna' (London, 1874-84), is now extremely rare and, even when obtainable, very expensive. Mr. Mosely, whose knowledge of the order is probably unrivalled, has rendered a great service to British entomologists by providing them with the present work.

The book is divided into three parts. Part I includes notes on collecting and preserving, gives a short account of the life-history and describes and illustrates external structures useful in identification. The system of classification adopted is that of Kolenati. This system is, as the author admits, 'artificial and perhaps not in true accord with the relationship of the various

groups, now regarded as families . . .' It is based on the relative number of segments in the maxillary palpi of the two sexes and, apart from the unnatural groupings which result, places the beginner in grave difficulties from the outset when dealing with females, for the system divides the order into two main divisions, in both of which the females possess five maxillary segments.

Parts II and III deal respectively with the two major divisions, Inaequipalpia and Aequipalpia. Keys are provided to families, genera and species. Under each species a reference is given to the original description and to McLachlan (see above), and there is a concise but adequate description of the imago together with clear figures of the external genital structures and, in some cases, of the venation. At the end of the book a number of pages are provided for notes.

Mr. Mosely is obviously a sturdy opponent of the 'law of priority,' and it may be that the nomenclature used will not be entirely acceptable to all modern workers.

In spite of the out-of-date system of classification and, perhaps, disagreement in some quarters with the nomenclature adopted, the work should fulfil the author's object as stated in the sub-title. It is now possible for entomologists to name the vast majority of their captures with confidence, and this should lead to a much-needed increase of our knowledge of the distribution and biology of the British caddis flies.

OBITUARY: JAMES JOHN WALKER, M.A., R.N., F.L.S., F.R.E.S., M.S.B.E.

By B. M. Hobby, M.A., D.Phil., F.R.E.S.

Engineer-Commander J. J. Walker passed away on 12th January, 1939, in his eighty-eighth year. He had been on the editorial staff of the *Entomologist's Monthly Magazine* since 1904 and from 1927 until his death was Editor-in-Chief. A portrait and detailed account of his life and writings from the pen of Sir Edward Poulton appeared in the March and April issues of that journal (1939, **75**: 64-70, 77-9), so that the following account is limited to personal reminiscences. The Commander joined the Society for British Entomology in 1933 and was Vice-President in 1937. Although not officially connected with our publications, he always helped in their production and read every proof, marking them with his keenly pointed pencil, for, as he would often remark, there were two things he could never resist, *viz.* 'sharpening a pencil and stroking a pussy-cat.' His knowledge of the British fauna and flora was profound, but his favourite groups were Lepidoptera and Coleoptera. He was never tired of extolling the virtues of Stainton's Manual of British Butterflies and Moths, his first introduction to ento-

mology, and he would still consult it when a name temporarily escaped him. Among British entomologists he was best known as a Coleopterist, and in his younger days was noted for his vigour in the field, and the trail of 'Walkerised' logs, rent asunder in his search for wood-boring beetles. Although he published many notes on the biology and distribution of rare and interesting insects, adding a number to the British list, it was his proud jest that he had never described one new to science. He collected extensively in the Oxford district and in the New Forest, which for many years he visited annually, staying with the late Dr. Sharp and his sister. His first and most carefully explored collecting locality in Britain was the Island of Sheppey, where he was born, and where he secured long series of the many rare beetles formerly found there. These he distributed freely among his friends, for anything in the nature of an exchange was repugnant to him, although the natural desire of his correspondents to reciprocate his generosity resulted in his acquiring one of the most complete series of British beetles ever in private hands. By his will a selection of his books, and his collection, which he desired should be preserved as an entity, were bequeathed to the Hope Department of Entomology at Oxford. His early life at sea on surveying cruises in the Pacific and around the coasts of South America, New Zealand, Australia and China gave him exceptional opportunities to visit little-known and out-of-the-way parts of the world, opportunities of which he made ample use, amassing large natural history collections and recording his observations in four large diaries. These, written under difficulties in the smoky atmosphere of the ward-room among his card-playing fellow officers, are remarkable for their clarity of expression and the beauty of his handwriting, features which remained unimpaired in his letters and contributions to scientific journals until the very end. Students of the natural history of these far-distant lands will be thankful that he had the foresight to leave these manuscripts to the Royal Entomological Society of London, where they may readily be consulted. Since his retirement in 1904 when he came to reside at Oxford, he visited the Hope Department regularly, helping in many capacities. He was keenly interested in the Oxford University Entomological Society, of which he was President since its reconstitution in 1922, and made a point of inviting undergraduate members to take tea with him and his daughter on Sunday afternoons, entertaining them with a wealth of stories and providing them with scores of treasures from his vast store of duplicates. His cheerful presence will be sadly missed by his many friends and especially by those at Oxford with whom he was in daily contact. We offer our deepest sympathy to his daughter, Miss I. Walker, and to his sisters, Mrs. G. C. Champion and Mrs. H. G. White.

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HISTORICAL, BIOLOGICAL AND ECOLOGICAL NOTES ON *OXYGASTRA CURTISII* (DALE) (order *Odonata*).

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Oxygastra curtisii (Dale) has an especial and sentimental interest for British entomologists, since it was first discovered and described in this country. Its restricted habitat and its appearances and disappearances over spaces of many years make it a most intriguing insect. Dale appears to have known the species from as early as 1820, but it was not until fourteen years later that he described it from the type specimen taken by Mr. Curtis on 8 June, 1831. The locality, Braunton Burrows, in Devonshire, mentioned by Curtis, where Mr. Cocks is supposed to have taken a specimen, has been visited by both Mr. Cowley and myself, and we are of opinion that it is a most unlikely locality for such a species.

From 1831 to 1878 *curtisii* was lost sight of, and we do not know if any attempts were made to find it during that long period. In the latter year Mr. Goss rediscovered it at Pokesdown, a locality some two miles south-west of the type locality. He again took it in the same place four years later, and a third time after a lapse of another eight years. Major Robertson, by employing directions given him by Goss, rediscovered the species at Pokesdown in 1901, and, from then until 1905, found it present in this locality yearly.

From then *curtisii* was lost sight of for the long period of twenty years, when I rediscovered it in the type locality at Hern. This was in 1925, when, being home on furlough from India, I was spending a holiday in Bournemouth, employing my time in collecting Odonata. After reading up the distribution given by Harcourt Bath in his 'British Dragonflies,' and those given by Lucas in his volume bearing the same title, I looked up Hern on several maps and found that it was spelt in four

different ways—Hurn, Hurne, Hern and Herne—and that it lay within the Hampshire border, and not in Dorsetshire as stated by Lucas. On the following day I found my way to Hern and there enquired of the village smithy if he could direct me to Ramsdown. He assured me that that was a name which he had not heard mentioned for many years, but which was well known to him and old residents of Hern. He gave me directions as to how to get there and I set off on my quest. Ramsdown, which I had no difficulty in finding, was at that time a lofty hill, further heightened by a crown of old Scots pine; to-day, after a disastrous forest and heath fire, it is a barren waste. It was with mixed feelings that I wandered through the pine and birch plantations which clothed the sides and approaches of the hill, over ground hallowed by the footsteps of the old British entomologists. Nearly a century had passed since Curtis took his type on this spot, and I wondered if history was about to repeat itself. Not more than ten minutes after my arrival, I caught sight of a dragonfly flying wildly in the air, appearing and disappearing as it silhouetted against the sky or vanished into the background formed by the silver birch. A few minutes later, with a lucky stroke, I took the insect and, looking into my net, found that I had taken *curtisii*. Curiously enough, that was the only occasion on which I took a *curtisii* in full flight; the insect is so cryptic when in the air that it is only when it appears against the sky that one has any chance of a stroke at it. The flight is so wild and so erratic, now up, now down, circling and performing figures-of-eight, that it is with very great difficulty that it is kept in sight for any length of time. In this respect its flight is astonishingly like that of the tropical, oriental *Idionyx* with which I had been so familiar during several years. Fortunately, as I soon learnt, *curtisii* always settles to feed, and when it does so alights low down, generally on the heath, where again its cryptic colouring conceals it in a remarkable way. In such places it is quite easily taken by dabbing the net over it.

Ramsdown forms part of a heath-land continuous with Sopley and Parley Heaths; it adjoins the private estate of Heron Court, and hence the jumble of localities which have been given are one and the same. Hern, I have been told, is an abbreviation of the name Heron, and its corruption from the latter probably depends on the western dialect. I was able to trace the habitat of *curtisii* on to Parley Heath and to satisfy myself that the species breeds in the Moors and Stour rivers at their confluence. The Pokesdown locality taps specimens from the Stour, whilst Parley Heath and Ramsdown tap those from the Moors river. I took fifteen specimens in 1925, and, in 1929, when home again on furlough, had no difficulty in refinding the species. I refrained from taking more than two in the latter year, not wishing to over-collect, although it was present in fair numbers. On my

return to India, I passed on the information of the locality to Mr. Morton, who, being unable to visit the locality, handed on my information to Dr. Killington. The latter, in company with Dr. Haines and the late Mr. Lucas, visited Hern on 29 June, 1930. Dr. Haines tells me that on that occasion they saw one or two but failed to make any captures. Both he and Lucas visited Hern on other dates in July, but no captures were effected in that year. Lucas and Dr. Haines renewed their visits in the following year, 1931, and the former finally took his first specimen. It is an ironical and melancholy fact that it was not until the year of his death that he secured this much sought-after treasure, and then only through the medium of information which he had supplied in the first place and which had been handed back to him. Lucas's specimen was taken on 4 July, and two days later Dr. Haines took two males and saw several others. He took a pair in the following year on 1 July and says: 'There were very many about that day and many could have been secured.' I never saw it in plenty myself, and probably half-a-dozen in one day was the maximum, and these had to be carefully sought for. From the year 1932, *curtisii* again vanished and no records of it have been published since; Dr. Haines, who visits Hern regularly year after year, has not seen a single specimen since. What then is the explanation of these empty years? From the year 1925 we have records of only six specimens having been taken, so that it is clear that over-collecting has not been responsible, and we must therefore look for some much more catastrophic cause. In 1932, the last year of *curtisii* plenitude, a disastrous forest and heath fire at the end of July swept right across Ramsdown, Sopley and Parley heaths, reaching the Moors river in at least one place. If this fire had occurred at the end of June or beginning of July, it must have swept the whole brood of that year out of existence, for there is nothing more destructive to insect life than the combined action of fire and smoke. But by the date of the fire, oviposition would have been completed and the next year's brood started on its life-cycle, so that we have to consider what happened to this brood on emergence in 1933. Two areas have to be considered, Pokesdown and Hern, the former not having been affected by this fire. At the time of my 1925 captures I was not aware of Major Robertson's captures at Pokesdown, but on receiving full information of these from Mr. Morton, I followed up the directions given by Goss and had no difficulty in finding the locality. The greater part has been cut up into a building estate, another slice now forms a rose nursery, and the remainder, which includes the very spot where *curtisii* was taken, is part of private property enclosed by a high, spiked railing. Pokesdown may no longer be considered as a habitat for *curtisii*, and there is sufficient evidence on the spot as to the

cause of its disappearance here. The solution of the mystery must be sought for at Hern.

I believe that there is a 'homing' instinct ingrained in Odonata, which, on emergence, compels them to seek the same sanctuary in the teneral stage, year after year. It is analogous, if not homologous, to the homing instinct in migrating birds. Without quoting a mass of evidence which has been accumulated by myself in the tropics, I may quote an instance nearer home. *Gomphus vulgatissimus* is found at its greatest incidence on the Oberwater, New Forest, at points where, on the right bank, the forest opens out into deforested heath-land, and, on the left bank, the forest slopes more or less steeply up to pine-clad heights. It is to the latter that the newly emerged *vulgatissimus* naturally goes, for there is little or no shelter in the opposite direction. When searching the banks of the river for exuviae, I was surprised to find more than forty of these on the forested or left bank, and only some half-dozen on the right, about a mile of the river being examined. It seemed clear that the larvae were aware on which side their sanctuary lay, for there was absolutely no difference in the characters of the banks of the river that I could see. Perhaps the occurrence of far more seepage into the river on this side from the watershed might have explained it or have supplied the information to the larval instinct? If we accept this 'homing' instinct as a theory and apply it to the case of *curtisii,* I think that it is possible to find a satisfactory explanation of their disappearance in 1933.

A glance at the map will show that Hern lies between the Stour and Avon rivers, but that Ramsdown forms a small watershed between the two, which latter serves or used to serve as a trap for the emerging *curtisii.* The homing instinct sent the insects, year after year, to the wooded parts of Parley Heath and Ramsdown, but when they emerged in 1933 these parts were a waste of blackened heath and charred stumps of pine trees : the sanctuary had disappeared and the insects had lost their bearings. They flew on, crossed the Avon, and finally reached the borders of the New Forest, this being the most likely and suitable locality. A somewhat analogous case may be quoted in support of this. In India I have sometimes experimented with a species of Sphegid or digging-wasp. These insects employ certain landmarks in order to find the location of their burrows. If, in a case where this is possible, these landmarks be shifted to the right or left of the burrow, the wasp on returning from her beat will orient herself by means of the changed locality of the landmarks, and so will be unable to find her burrow. If an artificial burrow be made in approximately the same place, having regard to the change in the situation of the landmarks, the wasp will usually go almost straight to it. In the case of *curtisii*, the landmarks had not been shifted, but they had been

stripped bare and altered beyond recognition, and so the insects flew on until they came to a habitat such as the one they sought. Odonata are most vulnerable to the attacks of birds during their teneral state, so that this flight, prolonged over the Avon valley, must have been attended by enormous mortality. Moreover, the dilution of the small numbers which reached the New Forest would be enormous in such a vast wooded area, so that the chances of the sexes meeting and pairing would be largely decreased. Towards the end of the season, when the females started to return to the Moors and Stour rivers for oviposition, they would have to cross the Avon, and it is certain that a hundred per cent. would be trapped by this water. Few or none would reach the old habitat, which for a space of years would no longer harbour the insect.

How then are we to account for the reappearance of the species at Hern? I think that there is no doubt but that this is due to overlapping of generations. In the case of *Gomphus vulgatissimus,* I have found young larvae in the Oberwater at a time when the adults were emerging, and there is no reason to suspect that a different procession of generations prevails in the case of *O. curtisii*; indeed, this overlapping is one of nature's chief methods of conservation of species, and were it not so many would perish in a single generation. I believe that the great majority emerge in one season and that following seasons see but a poor residue; it is because of this paucity that any local fauna takes so long to recover strength when the major emergence has been wiped out by any such catastrophe as a forest fire.

Although I have never found the larvae of *curtisii* in the Moors river, I have found the exuviae, and figure one of these (fig. 7), as it appears to show more detail than the figure given by Lucas in 'The Aquatic Stage of British Dragonflies.' Thus there are two thin ridges on the vertex and occiput, the latter bearing a tuft of long stiff hairs; the spines on the prothorax are more obtuse, and it is probable that an agglutination of long hairs made these appear to be more acute and longer in Lucas's specimen. There is an obtuse spine on each side of the head and the eyes seem more prominent; the abdomen is stouter and the dorsalis appendix is abruptly constricted at about half its length; lastly, there are some median strongly haired tubercles on the five middle segments of the abdomen.

The actual place of *Oxygastra* in the family Corduliidae has never been discussed. Selys says, 'Tous les triangles libres'; but this is not correct for all specimens, for I find that in my remaining nine specimens, five have one or both of the triangles of the hindwings crossed by a vein. Moreover, there is a high percentage of archaic or vestigial remnants in the wings. Thus four specimens possess accessory cross-veins to the bridge; one

has an extra cubito-anal vein in one hindwing; six specimens have the costal border of the triangle in the hind- or both wings broken, as in the archaic Libelluline genera *Tetrathemis, Risiophlebia,* etc., or Corduline genera *Synthemis, Cordulephya, Pentathemis* and *Neocordulia.* In the hindwings, it is noticed that wherever this border is broken the triangle is crossed by a vein. In three specimens owned by Dr. Haines all the triangles

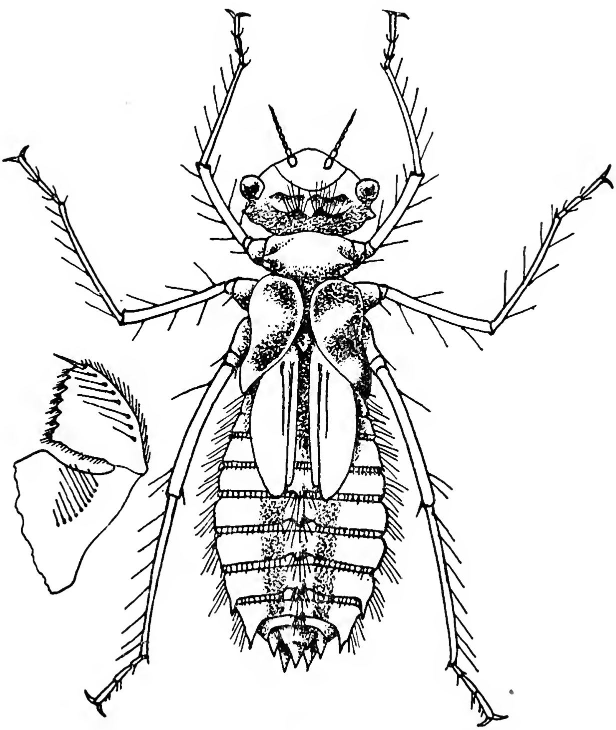

FIG. 7.—Larva of *Oxygastra curtisii* (Dale).

are entire, but there is a slight angulation of the costal border in some of the wings of two of the specimens. Lastly, in one of my specimens the discoidal field begins for a length of several cells as a single row of cells instead of the usual two. These variations are so frequent that they cannot be regarded as freaks or abnormalities; they are indeed evidence of a lack of crystalization of the venation and, as such, rank the insect as definitely archaic. In the struggle for existence, *Oxygastra curtisii* has been almost crowded out by *Cordulia aenea,* its more successful British relative, and, in regard to its future in

this country, that must be held to be exceedingly dark; the rapid spread of building from Christchurch to Bournemouth must soon overwhelm its present habitat, and yet another species will be written off from our dwindling fauna.

Before closing this paper, it will be of interest to note that two other species of Odonata which are associated with *O. curtisii* at Hern are also subject to the same rise and fall in numbers, appearances and disappearances, and it is probable that the same adverse circumstances have operated against these insects. The first of these species is *Gomphus vulgatissimus* Linn., concerning which I find the following note in a letter by J. C. Dale on 6th Dec., 1861: 'I once saw *Gomphus*

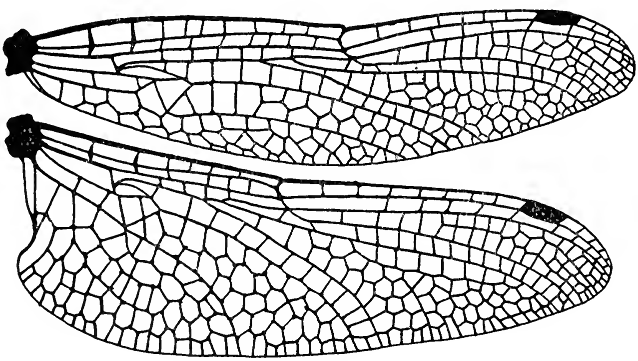

FIG. 8.—Wings of *Oxygastra curtisii* (Dale), ♂, exhibiting the following archaic venation: primary antenodals still present, antenodal complex irregular, discoidal cells with costal border broken, and that of the hindwing traversed by a vein, an additional cubito-anal cross-vein in forewing, an accessory cross-vein to bridge in forewing, where also the discoidal field begins with a single row of cells.

vulgatissimus in such plenty by the Moors river coming down from Parley Heath that it fully conformed to its name, but of late years I have seen none.' During the large number of visits which I have paid to Hern over a number of years, I have never come across this species, but Dr. Haines has taken one specimen over the Moors river. The second species is *Libellula fulva* Müll., which was swarming over the Moors river in 1925 and was everywhere observable settled on the heather over Parley Heath; since then it has either been entirely absent or very rare. I find no mention of the species in Dale's letters, but Mr. Morton in company with McLachlan took it at Hern many years ago, and says that it was considered a rare insect at that time. Bath, in giving Parley Heath as a habitat of this insect, says that it is very rare and local (1890). In 1938 I found it absent

at Hern, but it was present in fair numbers over bog pools bordering the Avon river, which lends colour to my theory that, having been driven from their old locality towards the New Forest, they were trapped by the Avon area on returning to oviposit.

My thanks are due to the late Mr. Kenneth Morton and to Dr. Haines for the long and helpful notes with which they have assisted me.

Addenda.

Since the above was written I am now able to give some further information showing that a resuscitation of *O. curtisii* in its old haunts has taken place. In July, 1938, I watched a dragonfly near the Moors river for some time, but it flew so low, so erratically and swiftly, that I was unable to determine what the species was, although the character of the flight pointed almost certainly to it being *O. curtisii.* On 20th June, 1939, I visited Hern again and went first of all to a spot where I had invariably found it to be present in 1925. To my great pleasure, I found a single male in flight here, and after waiting for some time for it to settle, easily secured it. About one hour later, I watched a second male in flight for some time on the slopes of Ramsdown. These were the only specimens seen that year, during repeated visits paid in June and July. This year, 1940, I found *C. curtisii* on the wing as early as 11th June, which goes to prove the correctness of the date 8th June, given by Curtis, but which I had always thought was an error for 8th July. On 19th June, I saw at least six specimens on the wing, only one of which was a female and which I observed at close quarters after waiting for it to settle. I took one male for purposes of record. On 23rd June, when I paid yet another visit to the locality, not a single specimen was to be seen, although conditions were ideal. A final visit on 2nd July also proved to be a blank, so that it would appear that the insect emerged very early this year and was as quickly over. There is no doubt, however, about its re-establishment at Hern and the new growth of birch and rhododendron, which is so noticeable now, affords ample protection for the insect in its teneral state.

F.C.F. (20.vii.40).

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PRELIMINARY NOTE ON THE EPHEMEROPTERA AND PLECOPTERA OF THE HAMPSHIRE AVON AND ITS TRIBUTARIES.

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Between 23rd April and 8th June, 1939, the authors collected nymphs of Ephemeroptera and Plecoptera in the Avon and its tributaries and bred out the adults with the object of obtaining material for taxonomic studies on the nymphs. These studies are still incomplete, but the present paper gives a list of the species found and some notes on the localities where they occurred.

Our centre was Fordingbridge, where Major C. Napier placed at our disposal a room and other facilities which made it possible to carry out the work with great success. We take this opportunity of expressing our gratitude to Major Napier. We would also thank Mr. H. P. Moon of the Avon Biological Research, and University College, Southampton, whose knowledge of the district, freely put at our disposal, was invaluable.

TECHNIQUE.

The nymphs were kept in enamel pie dishes measuring 12 × 9 × 2 inches. The dishes were filled with water to a depth of about one inch, and covered with sheets of glass. When the sub-imago emerged it was transferred to a jar to await the final metamorphosis which would give rise to the imago, and the cast nymphal skin was mounted on a slip of celluloid. When the imago appeared, it and the cast subimaginal skin were

either preserved in $2\frac{1}{2}\%$ formalin, or mounted in the same way as the nymphal skin, in which case all three slips of celluloid were impaled on one pin.

One of the reasons why this technique of keeping running water species in still water was satisfactory was probably the fact that the dishes could be filled with water direct from the Avon. It was only among nymphs from localities with extremely rapid flow that there was heavy mortality. On very hot days it was found difficult to bring nymphs home alive from a distance, but at several localities it was possible to catch the sub-imago and the cast nymphal skin as emergence took place under natural conditions.

Description of the Localities Visited.

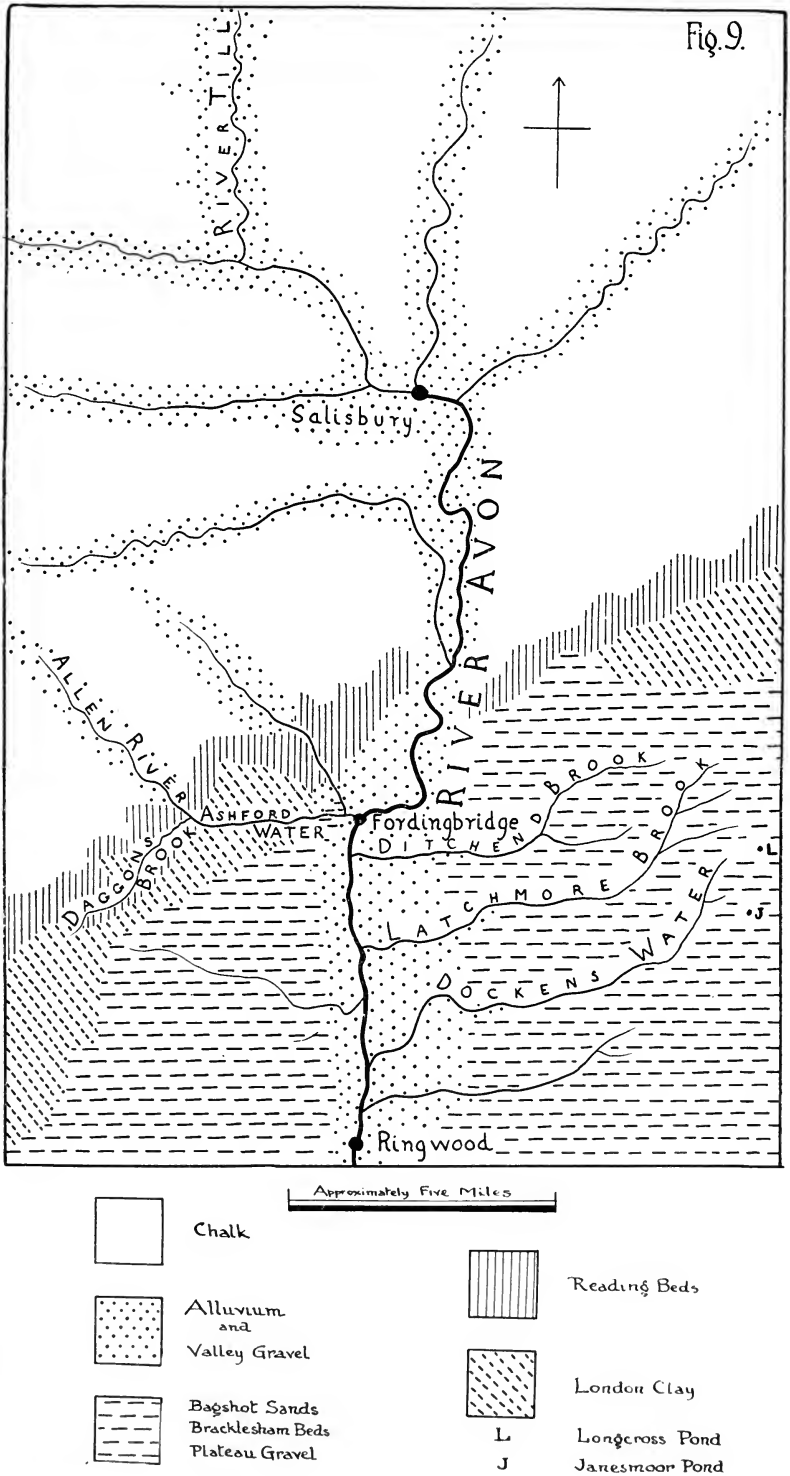
Fig. 9, which is based on a tracing for which we are greatly indebted to Mr. C. J. Banks, shows the streams visited and the general geological features of the area in which they lie. The Avon itself and most of its tributaries rise in the chalk downs and have, in consequence, alkaline water, but a few tributaries come in from the New Forest, a region of which the various geological formations (Bagshot Sands, Plateau Gravel, Bracklesham Beds, etc.) all agree in being deficient in bases, so that the water which drains from them is acid. Moon (1939) gives further details about these two types of stream. One small tributary rises in and flows through an outcropping of Reading Beds and London Clay; there are no data about the chemistry of its water. Moon (1936), working on the Avon, recognised five main habitats :—

1. Main channels
2. Acid tributaries (pH 6·0—6·5)
3. Alkaline tributaries (pH 7·5—8·5)
4. Water meadows
5. The estuary.

No Ephemeroptera or Plecoptera were taken in the water meadows, where only the small channels were worked, and the estuary was not visited. The Reading beds tributary, Daggons Brook, was found to have a somewhat distinct fauna, and we propose therefore to treat it as a separate habitat. The geology of the bed is the only feature by which it may be distinguished, and, for the sake of uniformity, the other streams may also be referred to in geological terms. Our collections, therefore, came from :—

1. Main channels
2. New Forest tributaries
3. Chalk tributaries
4. Reading Beds tributary.

Fig. 9.


River Till
Salisbury
River Avon
Allen River
Ashford Water
Daggons Brook
Fordingbridge
Ditchend Brook
Latchmore Brook
Dockens Water
Ringwood
L
J
Approximately Five Miles
Chalk
Alluvium and Valley Gravel
Bagshot Sands
Bracklesham Beds
Plateau Gravel
Reading Beds
London Clay
L Longcross Pond
J Janesmoor Pond

1. *Main channel.* Though fig. 9 shows a single main channel, the River Avon is actually a complex network of channels,* and the many sluices and weirs result in great variation of the speed of the current. Most of our collecting was done at East Mills, where we recognised :—

(*a*) Weed beds. These consisted of dense beds of *Ranunculus* with some *Elodea* and *Callitriche* in slow flowing water just before the river enters the mill.

(*b*) Stony bottom. There was a small channel by-passing the mill, and here the current ran swiftly over a bottom of stones of which the largest was about the size of a swan's egg. More natural stony regions occurred in the main channel, but it was difficult to collect in such places.

(*c*) Weir walls. Several species, not found elsewhere, occurred in the moss growing on the walls of the up-current side of a weir and also in the masses of drifting vegetation whose further progress downstream was prevented by the weir. The specimens collected here may have drifted down for some distance and it is not possible to make a definite statement about their usual habitat.

Other regions of the Avon visited were :—

(*d*) Tyrrell's Ford. Here the river is shallow and runs swiftly over a stony bottom on which a few clumps of *Ranunculus* grow.

(*e*) Bisterne. Here conditions of flow and vegetation density are intermediate between those at Tyrrell's Ford and the East Mills weed beds.

2. *New Forest Tributaries.* The following four New Forest streams, of which the last named does not flow into the Avon, were visited: Ditchend Brook, Latchmore Brook, Dockens Water and Ober Water. They have a medium or fast flow over a bottom of small stones, among which occasional patches of *Juncus fluitans,* etc., grow. On 7th June, Ditchend Brook had dried up; there was not time to investigate the other three.

3. *Chalk Tributaries.* Ashford Water flows through the Reading Beds and London Clay, but most of its water comes off the chalk and it appears to offer habitat conditions very like those of the main channels. It is a large tributary with a fair flow. The bottom is stony, and there are dense beds of vegetation, chiefly *Ranunculus.* Allen River and Till River are smaller and the flow is less. The development of vegetation is

* A map of the main channels of the River Avon may be found at the end of every Annual Report of the Avon Biological Research.

considerable. On 6th June, though the flow of Ashford Water was not greatly diminished, Allen River had practically ceased to run; unfortunately it was not possible to pay a second visit to the River Till.

4. *Reading Beds Tributary.* Daggons Brook is a small stream with a fair flow over a sandy bottom. For most of its length it flows through thicket and there are frequent collections of dead leaves held up by sticks. In the open patches there are tufts of *Callitriche* and other plants.

There was another small stream, Cooper's Bottom, which does not fit into this scheme. It is a slow muddy stream with some *Callitriche,* and flows through a marsh to join the Beaulieu River.

Species Collected.

Of the species collected the Ephemeroptera were identified by Mr. D. E. Kimmins and the Plecoptera were identified by Mr. H. B. N. Hynes; we take this opportunity of thanking these gentlemen. Almost all the specimens were obtained by breeding out. Except for *Ephemera danica* no adults were taken in the field, and nymphal identification has only been relied on in a few instances; these are indicated by 'N' in Tables I and II. The English names are taken from Mosely (1921).

The following are the species of Ephemeroptera :—

Ephemera danica Müller (the Mayfly). A number of adults taken on the wing all belonged to this species. There was a moderate hatch towards the end of May.

Heptagenia sulphurea (Müller) (the Little Yellow May Dun or Yellow Hawk). Nymphs occurred on the stony bottom at East Mills. Among the stones were a few bricks and half-bricks, and these were always the best places to find the nymphs.

Baëtis niger (Linnaeus) (the Iron Blue Dun and Jenny Spinner (♂)) was very numerous in the weeds at East Mills, where in abundance it was second only to *Centroptilum luteolum.* It also occurred in Cooper's Bottom and Ober Water.

B. pumilus (Burmeister) (the Iron Blue Dun, Jenny Spinner (♂), and Little Claret Spinner (♀)), occurred in all the habitats at East Mills and was fairly abundant in the weeds. It was also taken at Bisterne, and in Ober Water and Daggons Brook.

B. rhodani (Pictet) (the Large Dark Olive and Red Spinner (♀)) was taken at East Mills and Cooper's Bottom.

B. tenax Eaton (the Olive Dun, Olive Spinner and Red Spinner (♀)) was fairly abundant at East Mills and also occurred in Daggons Brook, Ashford Water, and Dockens Water.

B. bioculatus (Linnaeus) (the Pale Watery Dun). A few examples were obtained at Bisterne, Tyrrell's Ford and East Mills.

Centroptilum luteolum (Müller) (the Pale Watery Dun) was very abundant and the commonest species in the weeds at East Mills. It was also found at B.sterne and in Daggons Brook.

Cloëon dipterum (Linnaeus) occurred in Latchmore Brook near the source, where the stream consisted of a series of small rills and deep pools. It was also taken in New Forest ponds at Janesmoor and New Park Farm and in a dewpond on Salisbury Plain.

C. rufulum (Müller). A few specimens were taken on the weir walls at East Mills.

Paraleptophlebia submarginata (Stephens) (the Turkey Brown) occurred in Daggons Brook and a few specimens were found on the weir walls at East Mills.

P. tumida (Bengtsson) occurred in the Rivers Allen and Till and was abundant in those reaches which were completely overgrown by such plants as grasses, *Mentha, Caltha, Ranunculus,* etc. It was surprising, in view of this abundance, to find that the species is new to the British List (Kimmins, 1939).

Leptophlebia marginata (Linnaeus) occurred in Cooper's Bottom and in a pond near Queen's Bower, Brockenhurst. A few specimens were also found on the weir walls at East Mills.

L. vespertina (Linnaeus) (the Claret Dun) was abundant in Ditchend Brook.

Habrophlebia fusca (Curtis) was abundant in Daggons Brook.

Ephemerella ignita (Poda) (the Blue-winged Olive and Sherry Sp:nner) was fairly abundant at East Mills, Ashford Water and Daggons Brook.

(These results are summarised in Table I.)

Owing to unfamiliarity with the group, our notes on the Plecoptera are not sufficiently complete to justify a separate description of the habitats of each species, and they are presented in tabular form only (Table II). An additional record has recently been made by Mr. H. B. N. Hynes, who visited Daggons Brook in December, 1939, and took there, among other species, *Taeniopteryx risi* Morton.

Discussion.

As already noted, the main object of the work was taxonomic, and it was not possible to make enough collections from enough places to discover much about the ecology of any one species or to contrast the fauna of the different parts of the river system. For instance, Tables I and II show considerable faunistic differ-

TABLE I.

Date Visited	24.iv	3.v 7.vi (dry)	18.v	17.v	29.iv 29.v		4.v 23.v		4.v 23.v	Various	22.v	22.v	Various	Various	11.v	4.v 6.v (dry)			
Geological Formation	New Forest						Reading Beds		Chalk										
										River Avon									
Species / Locality	Cooper's Bottom	Ditchend Brook	Latchmore Brook	Dockens Water	Ober Water		Daggons Brook		Ashford Water	East Mills Weed Beds	Bisterne	Tyrrell's Ford	East Mills Weir Piles	East Mills Stones	River Till	River Allen		Earliest Emergence	Latest Emergence
Cloëon dipterum	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9.v	23.v
Leptophlebia vespertina	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.v	15.v
L. marginata	×	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	26.iv	2.v
Baëtis rhodani	×	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	26.iv	2.v
B. niger	×	—	—	—	×	—	—	—	—	×	—	—	—	—	—	—	—	26.iv	29.v
B. tenax	—	—	—	×	—	—	×	—	×	×	—	—	—	×	—	—	—	2.v	28.v
B. pumilus	—	—	—	—	×	—	×	—	—	×	×	—	×	×	—	—	—	10.v	29.v
B. bioculatus	—	—	—	—	—	—	—	—	—	×	×	×	—	—	—	—	—	22.v	29.v
Centroptilum luteolum	—	—	—	—	—	—	×	—	—	×	×	—	—	—	—	—	—	26.iv	25.v
Ephemerella ignita	—	—	—	—	—	—	×	—	×	×	—	—	—	—	—	—	—	2.v	2.vi
Chloëon rufulum	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	29.v	3.vi
Paraleptophlebia submarginata	—	—	—	—	—	—	×	—	—	—	—	—	×	—	—	—	—	25.v	30.v
Habrophlebia fusca	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	19.v	2.vi
Paraleptophlebia tumida	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	—	5.v	19.v
Heptagenia sulphurea	—	—	—	—	—	—	—	—	—	—	—	—	—	N	—	—	—		

TABLE II.

Type of Locality	New Forest Streams			Reading Beds Stream	Chalk Streams				
Species / Locality, Habitat Features and date visited	Latchmore Brook 18.v (Vegetation)	Dockens Water 17.v (*Myriophyllum*)	Ditchend Brook 3.v (Dead leaves)	Daggons Brook 4.v and 23.v (Dead leaves)	Allen River 4.v (Stones and vegetation)	Till River 11.v (Stones and vegetation)	River Avon various (various)	Date of first emergence	Date of last emergence
Amphinemura cinerea (Olivier) (the Needle Fly)	—	N	—	—	—	—	—	—	—
Nemoura variegata Olivier	×	—	×	×	—	—	—	24.iv	5.vi
Chloroperla torrentium Pictet ..	—	×	×	—	—	—	×	18.v	25.v
Nemurella inconspicua Pictet ..	—	—	—	×	—	—	—	—	26.v
Amphinemura standfussi Ris. ..	—	—	—	×	—	—	—	23.v	26.v
Isoperla grammatica Poda ...... (the Yellow Sally)	—	—	—	×	×	N	N	8.v	27.v
Leuctra geniculata Stephens ... (the Willow Fly)	—	—	—	—	—	—	N	—	—

ences between the four New Forest streams. The explanation of this is not that each one presents different habitat conditions, but that each one was visited only once, or possibly twice, that the visits were on different dates and that only a portion of each stream was worked. Attention may, however, be drawn to three points.

1. Ditchend Brook and Allen River afford an interesting contrast. Allen River has rather more vegetation, but in other respects the two streams have many similarities, even to the extent of drying up at the same time. Ditchend Brook is, however, a New Forest stream and Allen River is a chalk stream; in Ditchend Brook *Leptophlebia vespertina* is abundant, in Allen River *Paraleptophlebia tumida* is abundant, and in neither stream was any other species found. The faunistic difference is likely to be related to the different geological substratum of the two streams.

2. *Heptagenia sulphurea* is one of the species with a flattened nymph and it is not likely to be found in places where there are no bare stones; that is, it will be confined to those reaches where the current is swift enough to prevent the deposition of silt. The occurrence of *Baëtis bioculatus* in greatest abundance at Tyrrell's Ford and Bisterne may indicate that this species is also characteristic of the swifter reaches, but this point cannot be settled on the small number of specimens at present available.

3. The rich fauna of Daggons Brook, which is the only locality from which *Amphinemura standfussi, Nemurella inconspicua* and *Habrophlebia fusca* were recorded, cannot be entirely an effect of random collecting, and is likely to be correlated in some way with the different geological formation over which the stream flows.

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ODONATA IN N.E. HANTS AND N.W. SURREY, 1939.

By A. W. Richards, M.A., B.Sc., F.R.G.S.

Insects of this order appeared rather earlier than was the case last year, though the difference was due in part to a better knowledge of their localities and habits. The similarity between species makes it imperative in most cases to net a specimen before recording it. In this connection windy weather is helpful, as dragonflies congregate on the lee side of masses of vegetation where they can obtain more food. Shade also is important, for many of the Anisoptera appear to be less able to distinguish objects when the latter are in the shade, especially when the insects are in the sunshine.

In the list below the date of first appearance is given immediately after the name. Localities additional to those noted last season, and published in the *Journal of the Society for British Entomology,* **1** (9): 262-264, are also given together with notes on unusual abundance or scarcity. In all cases the specimens were netted and examined.

Zygoptera.

Agrion virgo (Linn.), 21st May. About twenty specimens of this species appeared in my sylvan garden at Hawley, Hants. where I had not previously seen it.

Agrion splendens (Harris), 3rd June.

Lestes sponsa (Hans.), 26th June.

Platycnemis pennipes (Pallas), 18th June. After finding a single specimen of this species at Godalming, Surrey, I searched for it along the Wey, Blackwater and Whitewater Rivers in Hampshire without success.

Pyrrhosoma nymphula (Sulz.), 13th May.

Ischnura elegans (Van der Lind.), 27th May. Occurs at Hawley Lake and Hartford Bridge flats, Hants.

Enallagma cyathigerum (Charp.), 20th May.

Coenagrion puella (Linn.), 26th May.

Coenagrion pulchellum (Van der Lind.), 27th May. This species occurs along the Basingstoke Canal, but not commonly.

Coenagrion mercuriale (Charp.). This species does not occur in this district to my knowledge, but on the morning of 3rd June I found it well out and in good colour at Otterbourne (Hants).

Erythromma najas (Hans.), 26th May. A specimen of this species infested with mites along the groove below the abdomen was placed with a few others in a darkened cage. The cage was left by accident with a small opening. The infested specimen was the only one which did not escape.

Palaeobasis tenella (Villiers), 11th June. I found this species in numbers, including both forms of the female, at a pond near Yateley, Hants. It seems to have disappeared from Woolmer Pond, Hants, since the pond was drained. Plenty still about 5th Sept.

ANISOPTERA.

Cordulegaster boltonii (Don.), 4th June. Common at Aldershot this season.

Brachytron pratense (Müller), 26th May. Common both sides of the county border this season.

Aeshna cyanea (Müller), 25th June.

Aeshna juncea (Linn.), 23rd July. Quite common at Fleet Pond, where females were ovipositing in cloudy weather on 30th August. It is not uncommon at a pond near Yateley, Hants. In the former locality every large green or blue dragonfly netted was of the present species.

Aeshna mixta (Latr.), 14th August. In addition to Fleet Pond, where it was again common, the species occurred at many points along the Basingstoke Canal, Hants, and at Elstead, Surrey.

Aeshna grandis (Linn.), 23rd July.

Anax imperator (Leach), 4th June. Last seen 28th Aug.

Cordulia aenea (Linn.), 26th May. The abundance of this dragonfly was a feature of the early part of the season. In a strong N. wind, I found them sunning themselves on birch bushes at Frimley Green, Surrey, in groups of half a dozen or so to a bush. It appeared in my garden and the Bourley Water Conservancy Area, in addition to the canal.

Somatochlora metallica (Van der Lind.), 10th June. Rather less common at the canal this season, but I found one at Fleet Pond and two at Elstead (Surrey). Several seen, 2nd Sept.

Orthetrum coerulescens (Fabr.), 11th June.

Orthetrum cancellatum (Linn.), 30th May. This species is widespread locally. Common at Fleet Pond and not uncommon at Yateley, Hants, and along the Basingstoke Canal, especially at Frimley Green, Surrey, where it undoubtedly breeds, but has I believe not previously been recorded.

Libellula quadrimaculata (Linn.), 21st May. Last seen 31st Aug. Wing shading very variable.

Libellula depressa (Linn.), 28th May. Common at Fleet and Aldershot, Hants, also Frensham, Surrey, but not noted after the middle of June.

Sympetrum s. striolatum (Charp), 10th July. Scarcer this season.

Sympetrum sanguineum (Müller), 23rd July. Noted quite commonly in new localities, viz. Frimley Green, Surrey, Dogmersfield and Crookham, Hants.

Sympetrum danäe (Sulz.), 16th July. Additional localities are Yateley and Hawley, Hants. On 28th Aug. literally hundreds were ovipositing at Elstead, Surrey.

ODONATA IN N.E. DERBYSHIRE.

By A. W. Richards, M.A., B.Sc., F.R.G.S.

A perusal of the distribution paragraphs of Miss C. Longfield's 'The Dragonflies of the British Isles,' 1937, gives the impression that only six species of this order inhabit the Peak County. This is entirely due to lack of observers, for Miss Longfield made use of all published matter concerning British dragonflies from the date of publication of 'British Dragonflies' by W. J. Lucas.

From personal acquaintance with N.E. Derbyshire I already knew of the existence of additional species in the area, and decided this year to spend the first half of August there. This quarter of the county is as unpromising a region from an entomological point of view as could be imagined. Many streams are fouled by discharges from chemical and other works, and in addition the weather during my stay was so unpropitious that I returned home on 11th August.

Below is a record of my observations made there on this and other occasions. In each case the specimens were captured, unless otherwise stated, and I venture to hope that Derbyshire entomologists will find some slight inspiration in them to encourage further investigations.

Species not previously recorded in the County.

Ischnura elegans (Van der Lind.). Common at the Chesterfield Canal at Renishaw and Killamarsh, also in Hardwick Park, whilst a few were found by the River Moss at Eckington.

Aeshna cyanea (Müller). One teneral female specimen was taken near Mosborough on 9th. Aug.

Coenagrion puella (Linn.). One specimen was taken at the Chesterfield Canal on 6th Aug., a dull day, just over the border in Yorkshire. I have no doubt that it also occurs in Derbyshire, as it was almost over when I left home.

Pyrrhosoma nymphula (Sulz.). I was too late for this species, which I found common in May, 1922, at the Chesterfield Canal, Killamarsh.

Brachytron pratense (Müller). This was probably over. I found several specimens in June, 1922, at the ponds near Rowthorne.

Species previously recorded in the County.

Libellula depressa (Linn.). I found this species in 1921 and 1922 at Tibshelf and near Hardwick Park.

Aeshna grandis (Linn.). This dragonfly was common this year at Renishaw, Hardwick Park and by the River Moss.

Aeshna juncea (Linn.). Formerly common near Tibshelf, but I did not meet with it this year.

Sympetrum s. striolatum (Charp.). I took one specimen by the River Moss, one at Pebley Pond, and one in Hardwick Park, whilst it was fairly common this year at Renishaw. All were more or less teneral and the species is evidently well distributed.

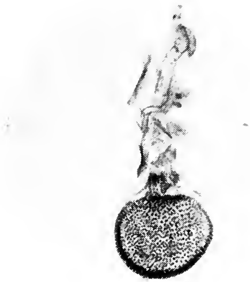
Cordulegaster boltonii (Don.). The head keeper at Hardwick Park described to me a dragonfly which he took by a ditch in the park on Whit-Monday this year. It could only have been the present species.

NOTE ON A SPECIMEN OF *POCOTA APIFORMIS* SCHR. (Dipt., Syrphidae), TAKEN IN SURREY, 1939.

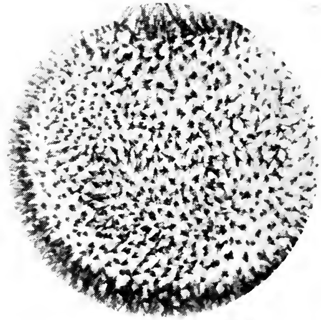
By Allen M. Low.

A female *Pocota apiformis* Schr. was taken by myself at Palewell Common, East Sheen, between Richmond and Barnes, Surrey, on 20th May, 1939. The specimen differs from all others that I have seen. The usual band and tufts of deep orange hair are, in my specimen, replaced by light lemon yellow, while there is also a slight difference in the coloration of the legs.

PLATE V



1



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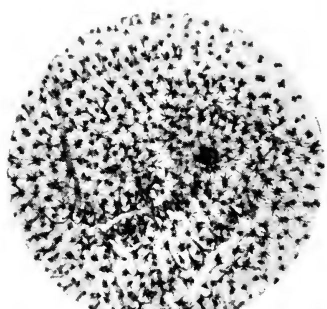

6

(1) *Eupithecia castigata*, the whole genital apparatus shewing long genital rods.
(2) *E. castigata*, bursa to shew instration of short spines.
(3) *E. castigata*, ductus bursa shewing spines and weak ostium.
(4) *E. castigata*, ,, ,, ,, ,, ,,
(5) *E. lariciata*, the whole genital apparatus shewing short genital rods and naked ductus bursa.
(6) *E. lariciata*, bursa to shew instration of longer spines.

EUPITHECIA CASTIGATA HÜBN. and *E. LARICIATA* FREYER (Lep.).

By W. PARKINSON CURTIS, F.R.E.S.

In the course of preparing the second section of the List of Dorset Lepidoptera which comprises the Geometridae, I have been compelled to check many of the records by genital preparations. The above two species of *Eupithecia* were a fruitful source of confusion, for, notwithstanding the lanceolate forewing of *lariciata,* the much rounder winged *castigata* was frequently referred to *lariciata.* I had the opportunity of a satisfactory control since I had taken in larch woods high up in the French Alps *lariciata* in localities where I did not get anything that could be referred even doubtfully to *castigata.* Preparations of this material compared with the rather scanty British material at my disposal satisfied me that my friend Mr. F. N. Pierce had been misled by an incorrect identification, and that the female organs portrayed by him on Plate 28 of the Genitalia of the British Geometridae (1914) were not only indistinguishable from those portrayed on Plate 31 as *castigata* but were in fact that species. W. Petersen (1909, *Iris,* **22**: Pl. 10, fig. 45B) had figured *lariciata,* and although the figure is rather coarse yet it agrees with the specimens referred by me to *lariciata* both British and French.

My friend Mr. J. H. Reid was kind enough to place his expert photographic technique at my disposal and has produced from my preparations the figures shown on Plate V.

Fig. 1 represents the entirety of *castigata,* fig. 5 of *lariciata,* and the mounts chosen shew a very close approximation of position. It will be observed that the genital rods of *castigata* are much the longer; that the ostium of *lariciata* is much the stronger; that the ductus bursae of *castigata* is relatively shorter and relatively narrower than that of *lariciata*; that the secondary sac of *lariciata* is a very well-defined rather short evagination, whilst in *castigata* it is a rather long indefinite organ. Both bursae are subglobular and that of *lariciata* is not double lobed (Pierce, *l.c.*: 47) if I understand what Pierce intended to convey. *Castigata* alone has the patches of spines directed anteriorly, *i.e.* away from the external genital aperture (figs. 3 and 4), the ductus bursae of *lariciata* being entirely devoid of ornament (fig. 5). Both bursae are wholly instrate, but even more extensively in *lariciata* than in *castigata.* Fig. 2 and fig. 6 shew the instration, and this is rather beautiful from a spectacular point of view as it consists of small spines each rising from the internal wall of the bursa from a star of thick-

ened integument, the number of rays to the star varying, being usually 5 or 6 in *castigata* but more numerous in *lariciata*. A careful comparison of fig. 2 (*castigata*) with fig. 6 (*lariciata*), where it is possible to see these spines laterally, shews them to be longer and stronger in *lariciata* than in *castigata*. Great care was taken in figs. 2 and 6 to avoid anything in the nature of double image due to either refraction or diffraction, and I think the star effect is in fact present and is not an optical delusion.

THE APPETITE OF YOUNG ROBINS.

By S. C. Brown, L.D.S.R.C.S.

During May, 1939, a pair of robins built a nest and were rearing young in my garden in Bournemouth. On the 21st the young were half grown, and the following experiment was carried out to test their capacity for food.

A tin containing about 150 mixed larvae of *Operophtera brumata* Linn. and *Hybernaria defoliaria* Clerck was opened and placed near the nest. It was noticed by both parents almost immediately, and they lost no time in carrying off the larvae to their young.

Between 5.55 p.m. and 6.25 p.m. (summer time) 16 visits were made, and the average number of larvae taken at a time was five. Only one larva was taken on the last visit by both parents. Thus about 80 larvae were consumed in half an hour by the five young that were in the nest.

Shortly afterwards the parents were feeding the young again, this time on a mixed diet of centipedes, woodlice and ants.

AMPHIPYRA PYRAMIDEA LINN. (Lep.) IN SCOTLAND.

By S. C. Brown, L.D.S.R.C.S.

On his return from a collecting trip to Aviemore, Inverness-shire in July, 1937, Mr. P. Harwood gave me a pupa of this species. The larva was beaten from birch. The moth duly emerged.

I pointed out to Mr. Harwood that this species has not been recorded further north than York, and I suggested that he might have done some collecting on his way, and the larva become accidentally mixed with his Aviemore captures, but he assured me that he did no collecting other than in the Inverness-shire locality.

SOME OLD RECORDS AND EXTRACTS FROM THE LETTERS OF J. C. DALE.

By Lt.-Col. F. C. Fraser, M.D., I.M.S. (Retd.), F.R.E.S.

Among the McLachlan correspondence, which came into my possession through the kindness of Mr. Charles McLachlan, a grand-nephew of the famous British entomologist, are a number of letters from the two Dales, J. C., and C. W. These have been presented to the University Museum, Oxford, since, but the following notes on Neuroptera and Odonata, which I extracted previously, will be of interest to present-day entomologists interested in those orders:—

Glanville-Wootton, dated 6th Dec., 1861, J. C. Dale.

'Such insects (Dragonflies) of powerful flight do *often* no doubt cross the Channel. Stephens' *Gomphus pulchellus,* for instance, the *unique*; he gave in print two localities for it and gave me *verbatim* a third—the fact was *his* memory was bad and made no memorandum, fancying it only the common species. I once saw *G. vulgatissimus* in the greatest plenty at Herne, and therefore the name was *not* a bad one at *that* time.

'Walker gave me a *Boreus hyemalis,* female taken in moss at Southgate.'

Glanville-Wootton, dated 25th Oct., 1861, J. C. Dale.

'It is curious I had a single specimen in my cabinet of *Agrion pumilio* for many years, no memorandum of its capture but I fancied I had taken it near this place (Glanville-Wootton)—last year or *year before* (without reference) I took a pair very near here and saw two or three more, but none since—I fancy there are either three sexes or two varieties of the female in *A. pumilio*.

'*A. tuberculosa* and *A. tenella*! De Selys wrote to me to ask if it was true I had taken *A. tenella* in England. I told him *in plenty* and J. Jenyns took it near Cambridge. He said it was very extraordinary! He has *since* taken it in Belgium. There are two or three in British Museum of Libella from cabinet of Stephens which have no authority for this except in his cabinet—some he had from old cabinets, but the *Lib. Fonscolombii* looks like a recent capture. I have a specimen of the true *Lib. vulgata* from Hull—De Selys th'ot that I might be mistaken as it is difficult to distinguish—but he allowed I was right. But the *Lib. rubricunda ?* he could not determine as the *very* thing which would have settled it was broken off. It was taken by Doubleday at Epping and the same year as I took *L. dubia* in Yorksh. which it most resembles, and very curious *L. pectoralis* its next neighbour was taken in Kent—do not some of these

cross the sea? such as Stephens' *Gomphus pulchellus,* for which he gave two localities in *print* and *viva voce* gave me a third for a *unique* British specimen, but this may be because he was not aware it was different from common one. I used to take some insects by beating down from Parley Heath and I once saw *Gomphus vulgatissimus* in *such* plenty which fully confirmed its name, but of late years I have seen none.'

6 Royal Crescent, Weymouth, 11th May, 1866, J. C. Dale.

'I cannot say that it *was Drepanepteryx* [spelt *Depranepteryx*] for certain we saw at Ivy Bridge not having *taken* it—neither that it was Perla *grandis* I saw some years ago, but it was *very* much like it and on looking *at it* in the British Museum (Foreign Cabinet) I saw it and on tickets "*Dartmoor*" which *looks very* like a confirmation. This was stuck with a *skewer* and *may not* be British? But why should "*Dartmoor*" be on the ticket? Many *Northern* insects are in Devon—as I can *prove* by experience.'

Glanville-Wootton, Sherborne, 31st March (year ?), C. W. Dale.

'Dorchester is merely a mistake of Curtis' for Doncaster where my father took *L. dubia. L. scoticum* is scarce at G.W. *Ae. juncea* we met at Penzance, August 1864. *I. pumilio* at Land's End, 1864, *A. mercuriale* at G.W.'

In another letter, J. C. Dale relates how he and his sons put up a supposed *Drepanepteryx phalaenoides* at Ivy Bridge, Dartmoor, which flew across the river and settled in bracken. They then put it up by throwing stones at it, but in the ensuing rush, lost sight of it and it escaped. It is to be very much doubted that this insect would rise again after having once descended to ground-level; more disturbance would only result in driving it still deeper into the undergrowth. I therefore think that it must have been either a *Notochrysa* or a Trichopteron, probably the latter.

These notes are of importance in several respects and seem definitely to disprove the occurrence of *G. pulchellus* in Britain; the locality Dorchester is also shown to be incorrect for *L. dubia.* The taking of *L. pectoralis* probably refers to the Sheerness specimen, taken in June, 1859 (Stephens' specimen of *G. flavipes* was originally named *pulchellus* and hence Dale's reference to it under the latter name).

Of great interest is a note in one letter commenting on the rise and fall in the incidence of species; Dale says: 'Insects certainly have not been so common of late years as formerly and I can remember some in swarms on Parley Heath, but the last time or two I was there, very few. For instance only saw

one *Hipp. semele* which abounded years ago. Some things are coming round again after 30 or 40 years or so. Some are common in one locality and rare in others.' (*E. semele* is again abundant on Parley Heath, especially during the present year, 1940.) Dale mentions the one time swarms of *G. vulgatissimus* and the subsequent rarity of that species at Herne. It does not appear to have since established itself on the Moors river, and the only known record of it there since Dale's time is a single specimen netted by Dr. F. Haines some four or five years ago.

BIOLOGICAL NOTES ON *EUMICROMUS ANGULATUS* (STEPHENS) AND DESCRIPTION OF LARVA (Neur.).

By Lt.-Col. F. C. Fraser, M.D., I.M.S. (Retd.), F.R.E.S.

From 1936 up to the present year, *Eumicromus angulatus* (Stephens) has been taken in considerable numbers at Linwood, New Forest. The first specimens were taken on August 19th in 1937, August 14th in 1938, August 10th in 1939 and as early as July 21st in the present year. In 1938 the species was particularly plentiful, when as many as sixty specimens were taken, the sweeping-net on several occasions containing as many as four after only a few minutes' work in a limited area. Last year, 1939, only trial sweepings were made, but they were invariably successful in securing specimens, which were afterwards freed. This year again, after a short trial sweep over some six yards of birch, two were found in the net; further sweeping was not carried out, as it was only desired to see if the species was still present.

It seemed clear that emergence took place towards the end of July and that, therefore, the best period for trying after larvae would be at the beginning of that month. On the 8th July, three unrecognized larvae together with some of Chrysopidae, were secured by sweeping in a similar manner to that by which the imagines had been secured. This was by gently inserting the net beneath branches of birch which either sprawled on the ground or were intimately mingled with the herbage growing at their foot. The net was then vigorously shaken and finally swept vertically upwards. Working in this way, one small isolated birch has yielded up at least two dozen specimens, since it was first worked. It is quite certain now that both larvae and imagines seek the lower branches of young birch and sallow; only a single specimen has been swept from herbage away from such localities or even from spots but a few feet from the sheltering trees.

The first larva secured was in its final instar and fed voraciously on green aphides obtained from birch. It entered the prepupal stage on the 11th July, that is, three days after capture, and this stage lasted until the 14th, when it pupated. Emergence of a female took place on the 25th July. The cocoon is white and consists of loose outer strands and an inner thin oval cell through which pupation could be easily observed. The markings of the larva were largely conserved in the pupa and the latter turned a dark shade of brown shortly before emergence.

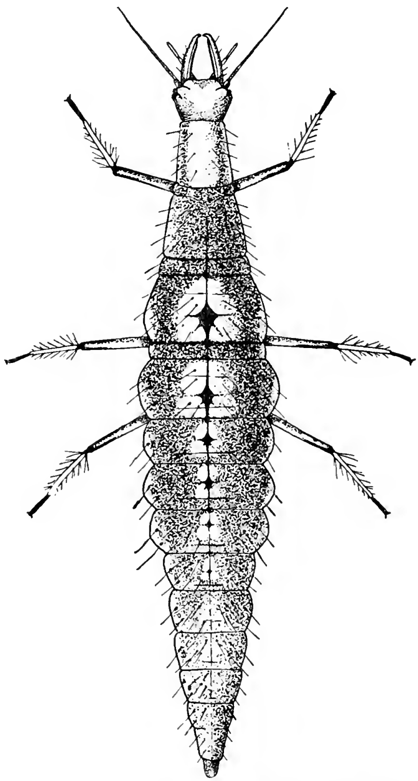

Fig. 10.—Third instar of larva of *Eumicromus angulatus* (Stephens). (Hairs omitted from femora.)

Description of final instar of larva (Fig. 10).

Length about 10 mm., more elongate and generally narrower than the Hemerobiid larva, but the mesothorax, metathorax and first three abdominal segments greatly swollen, after which the abdomen is abruptly narrowed and tapers to the end. (The

appearance thus presented is reminiscent of a lizard which has lost part of its tail by autotomy and is developing a new end to it.) The prothorax as a whole is unusually long, as long as the mesothorax when the larva fully extends itself. The colour is livid to dark purplish marked with pale carneous. The antennae are twice the length of the mandibles and consist of a short basal conical segment, a much narrower, longer and markedly annulated segment and a short terminal one which ends in a short bristle. These and the palpi and borders of mandibles are dark fuscous and the rest of the head is unmarked save for some light clouding of fuscous each side. The mandibles are longer than in the Hemerobiidae and are furnished with a few short setae. The legs are cream-white with the anterior surface of the femora, the distal ends of same, the proximal ends of tibiae and the whole of the tarsi blackish; the empodium is pad-like and rather large, the femora rather sparsely and the tibiae rather thickly furnished with setae, many of these arising in pairs on the latter. A subdorsal fascia extends the length of thorax and abdomen, being linear and poorly defined on the anterior part of prothorax but deepening in intensity as it approaches the thorax; the sclerites here are pale and very inconspicuous. The thorax and first three segments of the abdomen are very dark purplish with large lateral pale carneous spots on each side bordered outwardly by a narrow pinkish stripe. In addition, each segment bears a mid-dorsal pale cinereous spot decreasing in size from segment to segment. A dark line runs from the mesothorax almost to the end of the abdomen and expands to a stellate spot subapically on each segment; the terminal segment is dark. Beneath the body is pale carneous or cream-white. A few rather long setae are arranged more or less symmetrically on the dorsum and sides of the body.

It will be seen that this description agrees largely with that given by Aubrook and his ' large swollen areas on the sides of the meso- and meta-thorax ' may indicate the curious shape of the larva given above. In 1938, the last specimen was taken on October 23rd, and this along with several others was kept in captivity for many weeks, the last one dying about the middle of January. This seems to indicate that *angulatus* hibernates in the imaginal state. My specimens were kept indoors, and the rooms being heated during the day would interfere with those physiological conditions necessary for a winter sleep. Moreover, none of the insects paired and none of the females appeared to be gravid, so that I am of opinion that pairing takes place after hibernation and that the summer larvae are the resultants of a spring pairing. During all the long weeks in which the insects were kept in captivity, they remained very quiet, often not shifting their positions for days together, and certainly they never fed during this period.

TETRIX CEPEROI I. BOLIVAR, NEW TO BRITISH FAUNA (Orthoptera, Tetrigidae).

By B. P. Uvarov, D.Sc., British Museum (Natural History).

The confusion about the British species of the genus *Tetrix* Latr.* allied to *bipunctata* (L.) has been cleared by recent work, summarised in Burr's useful little book (1936, British grasshoppers and their allies), where two species, *bipunctata* (L.) and *vittata* (Zett.), are clearly differentiated. The third British species of the genus is *T. subulata* (L.), which is so clearly distinct from others by its long pronotum with a relatively low crest, that its identity was never subject to a doubt. My recent studies of the Mediterranean species of the genus suggested, however, that more than one species is confused under the name *T. subulata,* and a re-examination of the British Museum material showed at once that there are two very distinct British species of this group. One of them is the true *T. subulata* (L.), while another is *T. ceperoi* I. Bolivar, known from N. Africa, Spain, Portugal and France, but recently recorded also from Holland.

The differences between the two species are as follows :—

T. subulata.	*T. ceperoi.*
Head in profile (Fig. 11).	
Vertex horizontal, strongly projecting in front of the eye, forming a distinct angle with the upper portion of the frontal carina ; that portion (from the top down to the level of the lateral ocellus) is vertical and weakly convex ; the median portion of the carina (down to the middle ocellus) is also weakly convex.	Vertex sloping forward, scarcely projecting in front of the eye, forming a very obtuse and rounded angle with upper portion of the frontal carina ; that portion is sloping forward and distinctly concave ; the median portion of the carina distinctly convex.
Head viewed from above (Fig. 11).	
Vertex projecting strongly in front of the eye ; obtusely angulate, with straight margins ; its width at the base nearly twice the width of an eye.	Vertex scarcely projecting in front of the eye ; broadly rounded, with rounded margins ; its width at the base not greater than the width of an eye.

* The priority name for the genus is *Acrydium* Geoffr., but an application is being submitted to the International Commission on Zoological Nomenclature for the suspension of rules in favour of *Tetrix* Latr., which is unambiguous, has a very long standing and forms a basis of a large number of derived generic names.

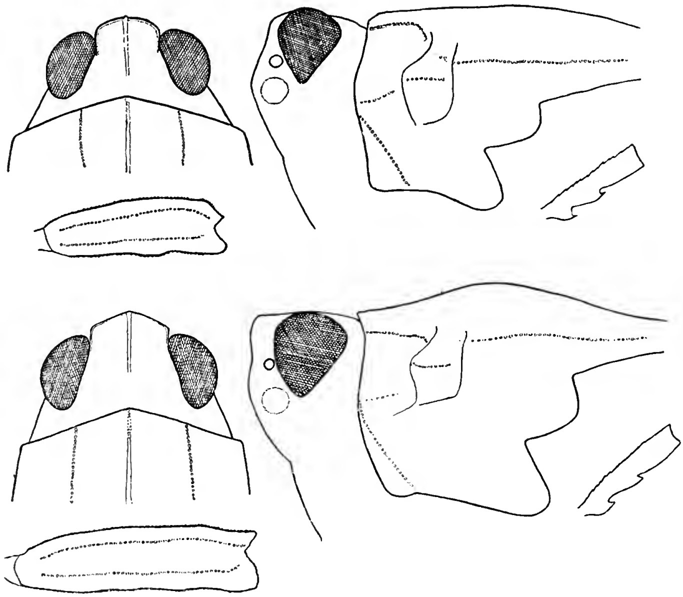

FIG. 11. *Tetrix subulata* (L.) below; *T. ceperoi* I. Bol. above. Head from above; profile; median femur; and posterior metatarsus.

Pronotum (Fig. 11).

Median carina thick and rather strongly raised only in the middle of the anterior portion, becoming quite low further behind.	Median carina evenly raised throughout, not higher than in *T. subulata,* but more compressed laterally and therefore appearing sharper and more prominent throughout.
Lateral carinæ in prozona straight, represented only by a series of low tubercles; in the rest low, obtuse.	Lateral carinæ in prozona weakly curved, represented by well raised tuberculate ridges; in the rest acute, distinctly raised.
Surface of pronotum very weakly concave at the shoulders, elsewhere evenly sloping from the median carina to the sides; covered by dense, evenly distributed, small granules.	Surface of pronotum distinctly concave not only at the shoulders, but further behind along the sides, rather suddenly rising to the median carina; covered by irregularly distributed granules, and irregular tubercles of varying size.

Legs (Fig. 11).

Anterior femur slender and long, with the upper margin regularly convex.	Anterior femur short and broad, with the upper margin somewhat wavy.
Median femur nearly five times as long as its maximum width, with the margins scarcely wavy.	Median femur less than four times as long as its maximum width, with the margins distinctly wavy.
Posterior femur more than 2.5 times as long as its maximum width, with the margins practically straight.	Posterior femur less than 2.5 times as long as its maximum width, with the margins distinctly wavy.
Posterior metatarsus with the first pulvillus acute, the second subacute.	Posterior metatarsus with the first and second pulvillus attenuated into very acute points.

Size.

Larger.	Smaller.

The characters tabulated above provide a definite proof that the two species are really distinct. For practical purposes of determination the shape of head viewed in profile and from above supplies the most easily appreciated difference, while other characters may be used as subsidiary ones.

The distribution of *T. ceperoi* on the Continent is insufficiently known. It was originally described from Cadiz and subsequently recorded from various localities in Spain, Portugal, as well as in Tangier. Azam (1901, *Misc. ent.*, **9**: 63) recorded it from the following localities in France: Var, Basses-Alpes, Ille-et-Villaine, Sologne, Loire-Inférieure and Metz; Chopard (1922, Faune de France, Orth.: 140) added records from Moselle, Deux-Sèvres, Aude, Herault, Aveyron and Tarn. Recently, Willemse (1931, *Natuurh. maandbl.*, 20; 4, sep. repr.) recorded this species from the Overijsel, Noord-Holland, Zuid-Holland and Limburg provinces of Holland. In the British Museum there are specimens from Guernsey, Channel Islands: Icart, St. Martin's, 23.viii.1924 (*W.E. China*); Guernsey, 10.ix. 1925 (*W. E. China*), and Zeuner has recently (*Proc. R. ent. Soc. Lond.*, B, in press) referred to *T. ceperoi* his record of *T. subulata* from Jersey, Channel Islands (1940, *Proc. R. ent. Soc. Lond.*, **9**: 106).

The distribution of *T. ceperoi* in Great Britain is, of course, a matter for further study, and all existing records of *T. subulata* must be revised after re-examination of specimens. I have

before me the following specimens of *T. ceperoi*: Dorset, Studland (*G. C. Champion*); Studland Bay, 1.vii.1937 (*E. W. Classey*); New Forest, 27.iv.1918 (*W. J. Lucas*).

The New Forest specimens obviously belong to the series mentioned by Lucas (1920, Monograph of British Orthoptera: 210) as collected by him at Marlborough Deeps, where he found them 'very commonly on ground rather sparsely covered with short grass and other small vegetation amongst the ponds and wet places.'

Most of the specimens of the true *T. subulata* in the British Museum are from the Stephens collection without definite locality data, and I am able to record it only from Wicken Fen, 17.vi.1926 (*Parks*) and 10.ix.1924 (*H. St. J. Donisthorpe*); Denham, Bucks, 19.vi.1926 (*J. Waterston*); and B. Salterton, S. Devon, ix.1923 (*G. C. Champion*).

It is to be hoped that the present note will induce collectors of British Orthoptera to re-study their specimens, and to pay more attention in future to *T. subulata* and *T. ceperoi,* with a view to the elucidation of their respective distribution, ecology and life-cycle.

A NOTE ON SOME IRISH HIPPOBOSCIDAE (Dipt.).

By Eugene O'Mahony.

There is little published on the Hippoboscidae of Ireland, and the following species do not appear to have been recorded from this country.

Ornithomyia lagopodis Sharp. Three specimens were taken by Mr. F. W. Fox while examining a freshly-shot grouse, *Lagopus s. hibernicus* Klien., killed at Killenarden Moor, Tallaght, Co. Dublin, in August, 1939. This species would seem to be confined to Scotland and Northern England from what Sharp says in his original description (*cf.* 1907, *Ent. mon. Mag.*, 58-60) and from information placed at my disposal by Dr. John Smart of the British Museum (Natural History).

A species of the genus *Lynchia* Wey. was taken from a Little Bittern, *Ixobrychus m. minutus* Linné, shot at Enniscorthy, Co. Wexford, in May, 1939. This specimen is 'possibly *L. massonati* Falcoz?' (*fide* Mr. B. Jobling), in which case it is an addition to the British list. It is also possible that it is *L. ardeae* (Macquart), a species once recorded as British by H. M. Hallett (*cf.* 1932, *Ent. mon. Mag.*, p. 133), the specimen being obtained from Purple Heron, *Ardea purpurea* Linné. I am indebted to Mr. A. E. Williams for the *Lynchia* and to Dr. Hugh Scott and Mr. B. Jobling for their help in running it down.

PHLUGIOLOPSIS HENRYI N.G., N.SP., A NEW TETTIGONIID, AND OTHER SALTATORIA (Orthop.) FROM THE ROYAL BOTANIC GARDENS, KEW.

By F. E. Zeuner.

I. Additions to the list of Orthoptera from Kew Gardens.

Since Lucas (1906, 1907) no additions have been published to the fauna of Orthoptera of the Royal Botanic Gardens, Kew. He knew twenty-one species of Orthoptera (comprising Dermaptera, Blattodea and Saltatoria), of which five only are indigenous and found in the open (*Labia minor* (L.), *Forficula auricularia* L., *Chorthippus bicolor* (Zett.), *Ch. parallelus* (L.), *Meconema thalassinum* (de Geer). Among the remainder, *Diestrammena marmorata* de Haan (mis-determination) should correctly be called *Tachycines asynamorus* Adel. (Gryllacrididae Rhaphidophorinae); it is a widely-distributed ground-living greenhouse species established in most botanic gardens and many private greenhouses (for instance at Richmond and Hounslow). I have been unable, however, to secure specimens at Kew, and since Uvarov (1921, 1939) recorded another similar-looking species of the Rhaphidophorinae from a hot-house in Richmond (*Dolichopoda bormansi* Br.W.), the record of *Tachycines* from Kew Gardens requires confirmation.

In 1906, Lucas mentioned a *Gryllodes* spec. indet., and in 1907 *Gryllodes* (? *hebraeus* Saussure). A *Gryllodes* is now abundant in the workrooms adjoining the Tropical Fern House (No. 2), as well as in several other heated houses, where it lives in company with *Periplaneta australasiae* (Fabr.) chiefly near the hot-water pipes in much the same way as the common house-cricket. The species is undoubtedly *Gryllodes sigillatus* (Walk.), already reported from greenhouses in other countries. *Gryllulus domesticus* (L.), however, has not been found in the Botanic Gardens at Kew, though it occurs regularly in the neighbouring streets, where it lives partly in the open.

The third species to be considered is new, as an inhabitant of greenhouses as well as to science. It is a small Tettigoniid belonging to the Meconeminae or Listroscelinae and obviously of tropical origin. It is described below as *Phlugiolopsis henryi* n.g., n.sp.

Only a short time ago, another species of the same group was reported from greenhouses of the Botanic Gardens of Berlin-Dahlem, *Phlugiola dahlemica* Eichler (1938). I caught this species myself in Dahlem about ten years ago (specimen Zool. Mus. Berlin) and am certain that the Kew Gardens species is

generically distinct from the Dahlem species, though resembling it in size and some of its habits.

II. Description of *Phlugiolopsis henryi* n.g., n.sp.

Diagnosis. Meconeminae, about 12 mm. long, with elytra almost hidden under the elongate pronotum. Eyes small. Anterior tibia armed with comparatively short but conspicuous spines, femur unarmed. Male cerci large, curved, with a blunt tooth. Ovipositor smooth, with a short, strong hook at the apex of the lower valve. Adults olive-grey, back of pronotum brown, tergites brown, hind femora and male cerci semi-transparent, grey.

Phlugiolopsis n.g.

Genotype : *Phlugiolopsis henryi* n.sp.

Remark : The generic diagnosis possibly includes specific characters which cannot be eliminated while one species only is known.

Distribution. Natural distribution unknown. Found in the Tropical Fern House, Royal Botanic Gardens, Kew.

Holotype. Female, author's collection.

Paratypes. Nine males, 4 females, 1 male larva, 1 female larva, egg and spermatophore in British Museum (Natural History). Six males, 5 females, 1 male and 2 female larvae in author's collection.

Measurements in mm., of freshly killed specimens.

	Male, paratype.	Female, holotype.
Head—end of abdomen, without appendages	11·1	11·7
Head, length	1·2	1·2
,, width, including eyes ...	2·2	2·1
,, height	3·2	3·3
Pronotum, length	4·6	4·5
,, width	2·8	2·7
Elytra, length	2·3	2·2
Abdomen, length	6·1	7·8
Cerci, length	2·0	0·9
Ovipositor, length	—	4·7
Palpi	3·3	3·5
Antennae	49·5	48·0
Anterior femur	4·1	4·2
,, tibia	4·8	5·0
,, tarsus	1·9	2·2
Hind femur	10·7	10·5
,, ,, max. thickness ...	2·2	2·2
,, tibia	10·7	11·0
,, tarsus	2·8	2·8

Description of adult female (Fig. 12A). In general habitus reminiscent of *Conocephalus dorsalis* (Latr.).

Head (Fig. 12B) resembling that of *Meconema thalassinum* (de Geer). Fastigium verticis blunt and conical, little prominent, reaching the basal third of the first antennal segment, forming

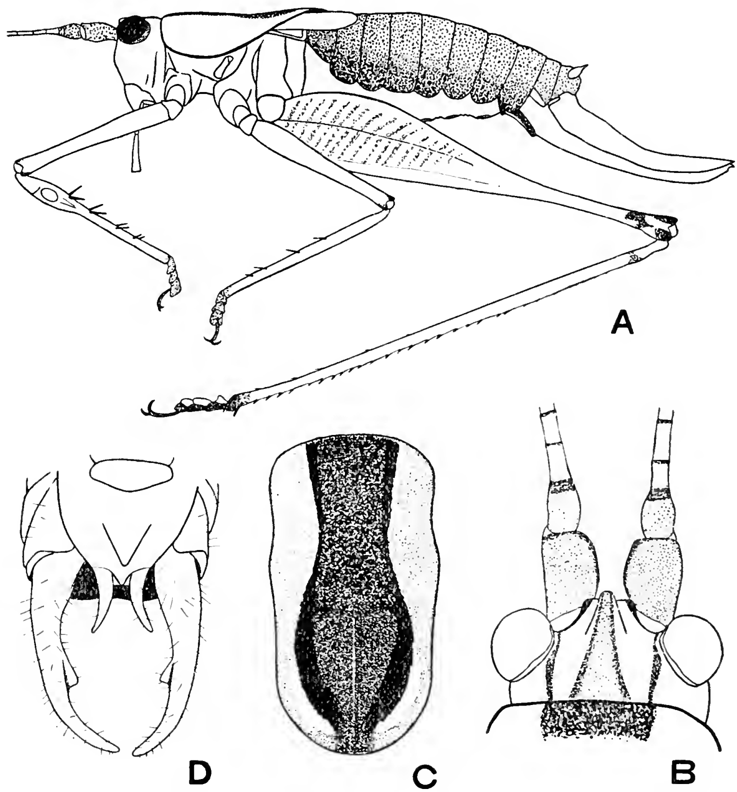

FIG. 12.—*Phlugiolopsis henryi* n.g., n.sp.

A. Side view of female, × 5. B. Head of female, seen from above, × 15. (The head of the male is identical.) C. Pronotum of male, seen from above, × 9.5. (The female pronotum has the same pattern and shape but is a trifle shorter.) D. Male genitalia from below, × 13.

the smooth continuation of the vertex, *not* constricted basally and not sulcate (difference from *Meconema*). Front in side-view distinctly inflated beneath the bases of the antennae. Eyes globular, comparatively small, in side-view hardly raised above the vertex, in life uniformly light brown with one dark spot

(difference from *Phlugiola*). First and second antennal segments enlarged. First very large, in side-view appearing inflated in middle, more slender at base. Second segment oval. Both are usually darker than the remainder of the antennae. Filiform portion 4-5 times as long as body, yellow with a dark ring on every 10th to 15th segment.

General coloration of head olive-grey, with two diverging blackish lines running from the fastigium verticis to the occiput and enclosing an obscured area, and one dark line on each side running from the antennal socket past the eye to the occiput.

Pronotum (Fig. 12c) in shape reminiscent of *Phlugiola,* long, with very narrow lateral lobes, rounded, without lateral carinae and without humeral excision. Metazona long, with a slight median carina and with the hind margin semi-circularly rounded. Metazona as wide as fore margin of pronotum as seen from above.

The pronotum is very shiny, the lateral lobes dark olive-grey, the back brown with a distinctive design. A central, dark olive-brown area continues the corresponding zone of the vertex of the head, and the two black stripes bordering it on the sides continue the black stripes of the head running from the antennal sockets to the occiput. On the pronotum, these stripes are thin and slightly constricted in the second and third fifths. On the metazona they diverge again and are broad, but they converge strongly and taper out at the hind margin. They are often followed on the outer side by a yellow line which is liable to fade after death. The back of the metazona is usually chestnut-brown.

The pattern of the pronotum distinguishes *Phlugiolopsis* from both species of *Phlugiola* (Eichler, 1938, p. 504).

Elytra very short, rounded apically, somewhat longer than wide, and extending very little beyond the hind margin of the pronotum. They are olive-grey, and brownish at the apex where they are not covered by the pronotum.

Hind wings absent.

Legs large and slender, olive-grey. Lobes of knees black. Tarsal segments short.

Anterior coxa with spine. Femur unarmed. Tibia with open, oval tympana anteriorly and posteriorly, and with four pairs of black movable spines on the inner side. The two proximal pairs are the largest and over twice as long as the tibia is wide in its middle portion.

Middle femur slightly longer than anterior. Tibia armed with four pairs of spines which are as long as the tibia is wide.

Hind femur reminiscent in shape of *Conocephalus,* not of *Meconema,* strongly swollen in basal half, very thin in distal half.

There is no hump on the basal portion, as described of *Phlugiola redtenbacheri*. The outside of the swollen portion shows a pattern of numerous slightly wavy, oblique, grey stripes which are more removed from the base of the femur above than they are below. In the middle, they are interrupted by a longitudinal line. The knee is darkened, as is the base of the tibia. A dark ring is indicated near the knee both on femur and tibia. Tibia thin, with numerous small black spines above. Below in the distal portion there are a few small spines at irregular intervals, three to seven on the outer side, and one to three on the inner. Terminal spurs one above, two below, outside as well as inside.

Abdomen with dark brown tergites and sternites (except first). Sides of tergites very dark. Soft intersegmental parts olive-grey, often pink or purplish on the underside at the base of the abdomen. Eighth tergite modified, reaching further down on either side and terminating anteriorly in a blunt cone separated from the remainder of the lower margin by a groove. (This structure tends to disappear in dried specimens.)

Subgenital plate broad and flat, undivided; its hind margin subangular, very slightly truncate apically, entire in fresh specimens, but with a small triangular excision in dried specimens.

Cerci very short and thick, almost inflated, with a small, slender point. (Difference from *Phlugiola*.)

Ovipositor broad and high basally, gently curved upwards, in side-view most slender in the middle. Apical margins smooth, upper valves very acutely pointed, lower valves with a small terminal hook. (Difference from *Phlugiola*.) Coloration (in life) chestnut-brown, blackish near base, in freshly moulted specimens blackish and olive-green.

Description of adult male. The male differs from the female in sexual characters only, except in the—

Pronotum (Fig. 12c). This is a trifle longer than in the female and its metazona is a little inflated.

Abdomen. Distal portion of underside yellowish-green.

Elytra oval, slightly extending beyond the hind margin of the pronotum. Stridulatory organ not reduced, in structure almost identical on both elytra, and with a row of fine, regular dentils on the underside of 1A. The organ evidently is capable of functioning (see p. 82).

Both elytra are pale and semi-hyaline, except along the fore margin and the apex, which are infuscate.

Male genitalia. Last tergite hardly modified, its hind margin nearly straight, with very slight concavities at the base of the cerci and in the middle.

Supra-anal plate trapezoidal, with straight edges.

Subgenital plate (Fig. 12D) with margins strongly convergent towards the apex. Styli close together, separated by a slight concave excision which, however, is not visible in certain positions. Dark brown with a light-coloured, often depressed, central portion.

Cerci (Fig. 12D) large for the size of the species, with tips bent inwards, bluntly pointed. A tooth is inserted on the inner side at about three-fifths from the base. This tooth is broad, flat and blunt, and directed obliquely downwards, so that it is hardly visible from above. Coloration of cerci pale grey, semi-transparent.

Drying of the specimens involves shrinkage and distortion of the genitalia.

Description of last larval stage. The last larval stage (the only one of which I have obtained specimens) differs from the adults, apart from its smaller size, in the bright green coloration, the much shorter and smaller pronotum, and the stouter hind femora.

In general habitus it resembles *Meconema meridionale* (Costa). The shade of the green, in particular, is similar. It is very intense, but somewhat pale. The hind knees are dark, as in the adults. The brown pattern of the pronotum is as a rule entirely absent. Some specimens have pairs of whitish spots on several of the abdominal tergites, and the contents of the bowels are often visible as a black line.

Description of the egg. A ripe, or nearly ripe, egg was found in one of the females. It is about 2 mm. long, brownish-yellow, reticulated all over, and with a circular cross-section. Micropylar end obliquely truncate, in top view with a brown, oval margin and an oblong groove in the middle.

III. Biological Remarks on *Phlugiolopsis henryi* n.g., n.sp.

In the adult stage, *Phlugiolopsis* has been found in the Tropical Fern House (No. 2) of Kew Gardens from the middle of July onwards. The more striking green larvae have been observed by the gardeners earlier in the year, and up to the middle of August I was able to find a few specimens in the last larval stage. Copulation took place from early August onwards. An old female, which had laid its eggs, was caught on 20 October, and no specimens have been observed later in the year. It is obvious, therefore, that the species has an ordinary annual life-cycle, with adults in the second half of the year, as have the common British and most exotic species.

The environment is, in this particular house, made up exclusively of tropical ferns. This need not mean, however, that

Phlugiolopsis is dependent on ferns. The temperature varies between 70-80° F. during the day and about 65° F. at night. The atmosphere is very damp, and the soft cuticle of the insect is in agreement with the high degree of humidity.

During the day, *Phlugiolopsis* is little active. The individuals sit quietly on the ribs of fronds, with legs and antennae pressed down, or on the underside of fronds or leaves in equally protected positions. Here they are often less cautious, the hind legs are bent in the knee in the usual walking position, and the antennae play about. Movements are nevertheless slow even when the foliage is disturbed, and the insects take to jumping only in a real emergency. A curious feature is that they are capable of moving rapidly backwards for a few inches when one tries to catch them. The same has been described of *Phlugiola dahlemica* by Eichler.

At nightfall *Phlugiolopsis* becomes more active. It walks about on the foliage, playing with the antennae and palpi, evidently in search of food. It is now much more sensitive to disturbances, its jumps are livelier and its reactions more rapid.

Six specimens which I kept under observation for over three weeks fed exclusively on small slow-moving insects, particularly on green-fly (*Aphis* sp.) and mealy-bug (*Pseudococcus longispinus* T.T., det. F. Laing). It differs in its feeding habits considerably from *Phlugiola dahlemica,* which attacks small flies, catching them in sudden jumps and holding the prey tightly between the spines of the fore-legs while eating it. I have not observed anything of this kind in *Phlugiolopsis,* which, on the contrary, is rather afraid even of small flies passing and invariably retreats. It appears to be specialised in feeding on slow-moving pests of plants and finds its food by walking about and searching with the palpi. These organs test incessantly the surface on which the insect is walking, and green-flies, etc., are seized directly with the mandibles when and where discovered. Very rarely are the fore-legs used to put the prey in position to be chewed up. The large eyes of *Phlugiola,* compared with the smaller eyes of *Phlugiolopsis,* are in keeping with the respective methods of preying of the two species.

It may be mentioned that young caterpillars of *Pieris brassicae* L. were eaten also, without adverse effects. The larger caterpillars of *Pieris* are undoubtedly poisonous, as demonstrated by an adult *Tettigonia viridissima* (L.), which fainted for several hours after having eaten part of a caterpillar of *P. brassicae.*

Unlike *Phlugiola dahlemica, Phlugiolopsis henryi* is not parthenogenetic. Copulation takes place during the night. Stridulation appears to be used by the male to attract the female, since I was able to observe how the pronotum was raised and an

attitude taken up exactly as by other stridulating species. I did not hear the sound, however, probably because it is too weak and possibly too high. Dentils are present on the first analis of the elytron, and the stridulating organ is certainly not reduced in any respect. Nightfall and the present black-out regulations prevented further observations.

Twice in the morning I found remains of a spermatophore attached to a female. Unfortunately, it had been partly eaten though in one case it was sufficiently complete to admit of a reconstruction. A spermatophylax is most probably absent. The ampullae are spherical and covered with a hard, semi-hyaline secretion which does not conceal the shape of the ampullae. There is a long duct attached to the ampullae, leading into the receptaculum seminis of the female. The structure of the spermatophore of *Phlugiolopsis* reminds one in every observed detail of *Meconema varium* (see Gerhardt, 1914, p. 14). This seems to confirm the close relationship of *Phlugiolopsis* with the Meconeminae.

In view of its food, *Phlugiolopsis henryi* must be considered as a useful insect. It should be protected and, where possible, introduced into hot and damp greenhouses. Feeding on greenflies, mealy-bugs, small caterpillars and other small-sized pests, it is bound to help the gardener in such places. I venture to suggest that the present scarcity of mealy-bugs in the Tropical Fern House at Kew is due to this year's increase in the number of *Phlugiolopsis* living there.

IV. Remarks on the Subfamilies Meconeminae and Listroscelinae.

Karny (1924, p. 105) summarised the history of the classification of the Meconeminae. Brunner v. Wattenwyl based the subfamily on the two European genera *Meconema* and *Cyrtaspis*. Later on, a few tropical genera were described but classified as either Conocephalinae or Listroscelinae. Karny suggested to remove *Teratura, Xiphidiopsis, Amytta, Phlugis* and *Phlugiola* from the mentioned subfamilies and to include them in the Meconeminae. They all have open auditory tympana at least on one side of the anterior tibia, and their prosterna are unarmed.

The reason why these genera were not recognised as Meconeminae before is that the anterior tibiae are armed with conspicuous spines reminiscent of those of the Listroscelinae. Karny emphasises that there is a complete transition from the minute spines of *Meconema* to the enormous spines of certain Listroscelinae (*Phisis,* etc.), and that the Meconeminae should be defined by the tympanum and prosternum instead.

Even so, it is difficult to regard the line of separation between the Meconeminae and Listroscelinae as clear-cut and natural.

The characters used are by no means constant in other subfamilies. Moreover, even with Karny's definition the fact remains that, for instance, *Phlugis* (Meconeminae) does resemble *Phisis* (Listroscelinae) in many respects. Rounded knobs occur on the mesosternum in *Phisis, Phlugis, Phlugiolopsis* and *Meconema*. They are smallest in the meconemintae genera and large in *Phisis*. They are still larger in *Listroscelis* and have become pointed spines in *Hexacentrus*. Thus, this character also cuts across Karny's line of separation. It may be that, ultimately, the Meconeminae and Listroscelinae will have to be fused. The great differences between the extreme members of the group, such as *Meconema* and *Listroscelis,* are due to their respective herbivorous and carnivorous habits, and the early authors have classified the carnivorous forms as Listroscelinae. Karny (1924) abandoned this distinction, but Eichler (1938), again relying on the biological difference, revived it, placing *Phlugiola* in the Listroscelinae.

The classification of the genera under consideration, therefore, is unsatisfactory at present. It is to be hoped that Mr. G. H. Henry, of the Colombo Museum, to whom the species described in this paper is dedicated, will be able to settle the problem of whether and how the Meconeminae and Listroscelinae can be separated. He has abundant material at hand, some of which has been published not long ago (Henry, 1932).

For the time being, I regard the following genera as Meconeminae:—*Meconema* Serv., *Cyrtaspis* F.W., *Acilacris* Bol., *Nicephora* Bol., *Cecidophaga* Karny, *Thaumaspis* Bol., *Xiphidiola* Bol., *Canariola* W. (*Orophila* Krauss), *Xiphidiopsis* Redt., *Amytta* Karsch, *Meconemopsis* Karny, *Phlugis* Stål, *Phlugiola* Karny, *Phlugiolopsis* n.g.

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AGRION SPLENDENS HARRIS (Odon.) IN WILTSHIRE.

By W. S. Cowin and K. Williamson.

We should like to place on record the occurrence of *Agrion splendens* Harris in considerable numbers in the Ashton Keynes district of Wiltshire. Along the small streams and ditches, and particularly the banks of the Isis, this dragonfly was abundant throughout June — so much so that we were astonished to find that it has not previously been recorded from this county. At dusk this splendid insect was to be taken at rest, wings closed above the thorax, when clinging to the leaves of hawthorn and other shrubs in the adjacent hedgerows. Our identification was confirmed by Mr. D. E. Kimmins of the British Museum, and specimens have been deposited with the British and Manx Museums.

EUPHYDRYAS AURINIA (Rott.) (LEP.) NEW TO SNOWDONIA.

By J. Antony Thompson, M.A., F.Z.S., F.R.E.S.

On 28th September, 1940, my wife, Mr. A. J. Merchant, Mr. S. H. Brocklesby and myself were collecting on one of the southern mountains of the Snowdon range. At an elevation of 750 feet my wife found a nest of *E. aurinia* larvae.

Further search by the four of us discovered about a dozen nests confined to an area of not more than half an acre.

The only other known locality in North Wales is near Dolgally, on level ground, so we are hoping that this discovery may provide a new local form.

Is this possibly the highest recorded altitude for *aurinia*?

BIRDS AND WASPS ATTACKING PIERIDS (Lep.).

By F. J. Killington, D.Sc., A.L.S., F.R.E.S.

During the recent plague (July and August) of white butterflies a large number of attacks on the butterflies by house sparrows and robins were observed and many others were reported to me. In most cases the butterfly concerned was the large white, *Pieris brassicae* (L.). The birds were occasionally

seen chasing and capturing the butterflies on the wing over streets and gardens, but more frequently they haunted the neighbourhood of buddleias and picked off the insects as they came to the flowers. The ground under the buddleias was frequently littered with the rejected wings, many of which showed numerous beak marks.

Several cases of wasps (*Vespa vulgaris* L., workers) capturing *P. brassicae* were noted during the first fortnight of August. In one case the wasp had seized a female butterfly by the distal end of the costal margin of the forewing. The butterfly was unable to rise with the weight of the wasp, although it fluttered about vigorously in the grass. Despite its rough shaking, the wasp kept a grip with its jaws and legs on the strong costal margin and gradually worked its way towards the thorax of its victim. Occasionally the wasp held on to blades of grass between its legs and the butterfly's wing, apparently in an endeavour to anchor the struggling insect down more firmly. Finally, a piece of the butterfly's wing came off in the wasp's jaws and the butterfly escaped.

While unable to state, from the small number of observations made, to what extent the butterflies were destroyed by wasps, there can be no doubt that robins and particularly sparrows played an important part in checking the pest.

NOTE.—Since the above note was written a much more detailed account of attacks by birds on *P. brassicae* has been given by Prof. G. D. Hale Carpenter (1940, *Ent. mon. Mag.*, **76**: 224-229).

ROBIN PREYING ON *STAURODERUS BICOLOR* L. (ORTH.).

By F. J. KILLINGTON, D.Sc., A.L.S., F.R.E.S.

On 5th August, 1940, at Parkstone, Dorset, a male robin was observed making repeated attacks on grasshoppers for a period of about thirty minutes.

The bird would stand on the ground perfectly still for a minute or two watching, and then make a sudden and swift dive into the grass, in most cases just too late to seize its intended prey. Perhaps a dozen such attacks had been made before it was successful in capturing a *Stauroderus bicolor* L., the species of grasshopper which seemed to predominate in that particular spot. With its prey in its beak the robin flew a short distance away and appeared to be dismembering the grasshopper before eating the softer parts; the hind legs and an elytron of the insect were afterwards found. Some six or seven grasshoppers were captured and eaten in this way in the course of about half an hour.

ACROCERCOPS OMISSELLA Staint. (LEP.) IN HANTS AND DORSET.

By S. C. Brown, L.D.S., R.C.S.

Meyrick in his Revised Handbook of British Lepidoptera gives S.E. England to Oxford and Norfolk for the distribution of *omissella*.

I have found the larvae in abundance in Bournemouth, and again, but not commonly, at Morden, East Dorset.

REVIEW: THE PRINCIPLES OF INSECT PHYSIOLOGY. By V. B. Wigglesworth, M.A., M.D., F.R.S. Royal 8vo, viii + 434 pp., 316 figs. Published by Methuen & Co., Ltd., London. 1939. Price 30/-.

By Frederick J. Killington, D.Sc., A.L.S., F.R.E.S.

With the publication of this book Messrs. Methuen have added still another great scientific work to their already famous entomological library. Whereas such well known standard general works on entomology such as those of Imms and Snodgrass have dealt primarily with morphology, the present volume emphasizes function and 'structure is described only to an extent sufficient to make the physiological argument intelligible.' The fifteen chapters deal with the following subjects: Development in the Egg; The Integument; Growth; Muscular System and Locomotion; The Nervous System; Sense Organs (Vision, Mechanical and Chemical senses); Behaviour; Respiration; Digestion and Nutrition; Excretion; Metabolism; Water and Temperature; Reproductive System. Throughout the book every effort has been made to provide concrete examples to illustrate each physiological characteristic, and every chapter concludes with an exhaustive list of references to guide the student who desires to follow up a particular line of study. The text is extremely well written and is both clear and concise, and the illustrations are good and adequate. It is a book which is absolutely essential to every serious student of entomology.

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A NEW SPECIES OF NEMOURIDAE (Plecoptera).

By D. E. KIMMINS
(Dept. of Entomology, British Museum, Nat. Hist.).

When my recent Synopsis of the British Nemouridae (1940) was published, I suggested that it was probable that further additions to our list would be made. I did not have long to wait. In early August I received a letter from Dr. Noel Hynes (then at Wray Castle), in which he wrote: 'I enclose a specimen of *Protonemura* that I took yesterday while out for a walk. Unfortunately it is the only one I got; I saw what I took to be a female but failed to catch it.'

'The enclosed specimen is a male, and as far as I can see a rather peculiar one. I thought at first sight it was *meyeri,* but the cerci are minute, the sub-anal plates very narrow and the armature of the intermediate processes much heavier than usual. . . .'

I agreed with Dr. Hynes that the specimen was not *meyeri* and urged him to try and obtain more material. About a week later I received from him another letter, from which this extract is taken: '. . . Last week it rained and blew alternately, so I did not venture up the mountain, but on Monday this week I again toiled up to the top and looked for this beast. On the way up, on the other side of the hill, I took a typical ♂ *P. meyeri* at 1,800 ft., . . . I then spent two very chilly hours on the beck where the other ♂ came from and got another ♂, which seems to be the same. . . . Some *Protonemura meyeri* taken at 1,800 ft. on Scandale Beck in April are quite typical, so this cannot be merely a race of *P. meyeri* confined to the tops; I only wish it was, because it will be a great pity to have yet another genus with one nymph unknown.'

I have since been able to examine Dr. Hynes' specimens more closely, and I am sure that the species is not only new to the British list but new to science, and I am describing it at his request.

Protonemura montana sp.n. (Fig. 13).

♂. More slender in build than *P. meyeri*. Head uniformly dark brown, without the pale transverse band behind the ocelli, found in *meyeri*. Prothorax dark brown, a little paler than head, slightly narrower behind, angles rounded. Meso- and metanota dark brown. Legs more smoky than in *meyeri*, pale dorsal spot on hind femur scarcely noticeable.

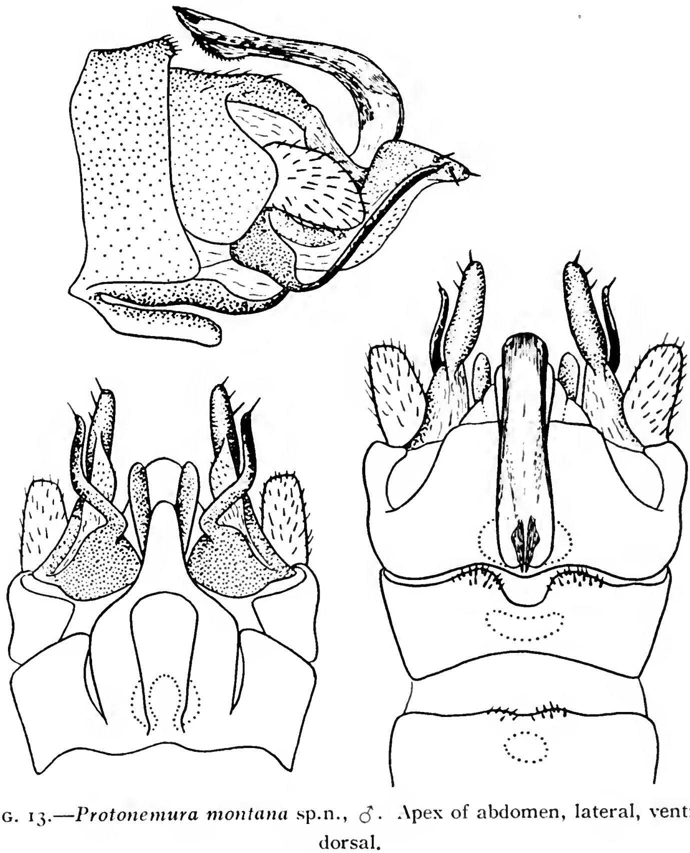

Fig. 13.—*Protonemura montana* sp.n., ♂. Apex of abdomen, lateral, ventral, dorsal.

Wings slightly smoky brown, with fuscous venation; pterostigma not conspicuous. Abdomen pale, tergites brownish at bases, pigmented area increasing from base to apex of abdomen; genital segments dark piceous.

Apical margin of ninth tergite with a rounded median excision between two slightly raised lobes, which are armed with

short spinules; eighth tergite only slightly excised and with fewer spinules. Vesicle spatulate from beneath, dilating towards apex, which is rounded. Subgenital plate rather broader than in *meyeri*. Supra-anal lobe recurved, more slender than in *meyeri*, ventral surface (surface applied to tergite) near apex with short spines. Cerci short. Sub-anal plates from beneath rather smaller than in *meyeri*, triangular, inner basal angle produced in a rather broad, thin blade. Apex of sub-anal plate carrying a sinuous, slender blade-like spine, directed upward and tailward. Outer margin of plate more sinuous. Intermediate appendage with a chitinised upper, outer margin. From the side, this chitinised portion is seen to be abruptly bent at right-angles before the apex, which is cylindrical, directed tailward, and carries three or four short spines. Membranous part of intermediate appendage small, forming a kind of ventral keel, not a finger-like process as in *meyeri*.

♀. See Appendix.

Length of anterior wing, 7 mm.; of body, 7 mm.

WESTMORLAND, Rydal Beck, 1,700-1,750 ft., 4, 12.viii.1940, 2 ♂♂ (*Noel Hynes*).

Type male in microscopical preparations, paratype male in 2% formaldehyde solution.

For the convenience of British workers, I have compared this species with *P. meyeri*, with which it might be confused at first sight. I suspect, however, it is more closely akin to *P. nimborum* Ris, a species known to me only from literature. Kühtreiber's figure (1934) of the side view of the genital appendages shows a similarly bent intermediate appendage. Ris' figures (1902) show that in *nimborum* the apices of the intermediate appendages are incurved, the sub-anal plates are more quadrate and their apical processes less sinuous. The membranous portion of the intermediate appendage is larger in *nimborum*.

APPENDIX.

Since the description of *Protonemura montana* sp.n. went to press I have been able to obtain more material of this species, including a number of females. I am thus able to add the following description and figure (fig. 14) of the genitalia of that sex.

♀. Subgenital plate of sternite VIII large, resembling that of *meyeri* rather than that of *praecox*, extending forward within sternite VII. Its apical margin is produced, widely and shallowly excised from the rounded lateral angles to the centre. The produced portion overlaps a pair of clavate plates. Sub-anal plates with irregular outer margins, terminating in somewhat dentate apices.

Length of forewing, 8-8·5 mm.

WESTMORLAND, Rydal Head, about 1,700 ft., 3.ix.41 (*D. E. Kimmins* and *Miss J. Storey*); Troutenbeck Head (near Langdale Pikes), about 2,000 ft., 4.x.1941 (*D.E.K.*). LANCS.: Torver Beck Head, above Goat's Water, 1,700 ft., 17.x.1941 (*D.E.K.*).

Allotype ♀, paratypes ♂, ♀ in the British Museum (Nat. Hist.), 1 ♂, 1 ♀ paratypes in the collection of Dr. Noel Hynes.

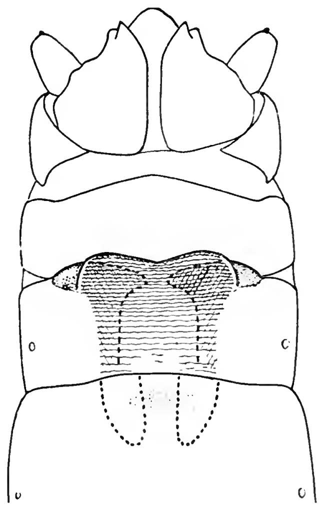

FIG. 14.
Protonemura montana sp.n., ♀. Apex of abdomen from beneath.

The original locality for this species is a small stony stream on the steep slope of Fairfield, at the head of the Rydal Beck valley. The adults were found chiefly on the shaded side of large boulders in or at the edge of the stream and were very active. The weather at the time of capture (afternoon) was warm and hazy, after a morning of low cloud.

It seems probable that the species will be found in other suitable localities, namely, where the stream is fast and stony and does not dry up during periods of summer drought.

I give below a modified key to the British species of Protonemura :—

1. ♂. Sub-anal plate with long, slender apical spine.
   ♀. Margin of subgenital plate sinuous or excised .... 2.
–. ♂. Sub-anal plate with very short apical spine.
   ♀. Margin of subgenital plate convex.
   .... *P. praecox* (Mort.).

2. Vertex of head behind ocelli with yellowish brown transverse band.
   ♂. Apex of intermediate appendage not bent at right-angles in cylindrical process.
   ♀. Margin of subgenital plate slightly sinuous. .... *P. meyeri* (Pict.).

–. Head uniformly dark brown.
   ♂. Apex of intermediate appendage bent tailwards at right-angles in cylindrical process.
   ♀. Margin of subgenital plate with wide shallow excision .... *P. montana* sp.n.

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A LIST OF THE PSOCOPTERA OF KENT, SURREY AND SUSSEX, WITH A REVISED LIST OF THE BRITISH SPECIES.

By D. E. KIMMINS
(Dept. of Entomology, British Museum, Nat. Hist.).

This list has been compiled from literature and from the collections of the British Museum, in the hope that it may stimulate interest in the Psocoptera, and encourage further publication of distributional records of these insects. Most of our county lists are obviously far from complete, since such scattered records as there are show that many species are widely distributed in Britain. Surrey is probably one of the counties most worked for insects. As a collecting ground, it has long been a favourite with entomologists, on account of the varying types of country and vegetation it contains, its accessibility, and the comparatively large area which is open to the public. It is not surprising, therefore, that of the three counties under consideration, Surrey heads the list with a total of forty-nine species from the sixty-eight on the British list, probably the highest yet recorded for any of our counties. Kent follows with thirty-three species, and thirty-two have been recorded for Sussex.

Of the species not yet recorded from Surrey, at least five are warehouse insects (probably recently imported) and one is an

inhabitant of the sea shore just above high-water mark. The remainder are either rare, or very small species, for the capture of which very careful search is necessary. *Hyperetes brittanicus* Harr., the littoral species just mentioned, has been found in the counties of Aberdeen, Northumberland, Yorkshire, Lancashire and Dublin, and very possibly occurs on some parts of the shores of Kent and Sussex. Its habitat has been variously described as 'under tufts of fine grass, close to high-water mark' (Bagnall, 1926); on 'sea beach, under stones' (Harrison, 1916, 1916*a*); and, under the name *H. guestfalicus*, 'among shingle and refuse on sea shore, just above high-water mark' (King and Halbert, 1910). The species has been taken in June, July and November.

As there has been a number of additions to the British list since Pearman (1926), I am giving a revised list, even though some species have not yet been recorded from the area under consideration. A blank column is included so that collectors may mark off captures relating to any particular county in which they may be interested.

		Kent, E.	Kent, W.	Surrey.	Sussex, E.	Sussex, W.	
	PSOCIDAE.						
1.	*Psocus gibbosus* (Sulz.)	×	×	×	×	×	—
2.	,, *nebulosus* St.	—	×	×	×	×	—
3.	,, *bipunctatus* (L.)	—	—	×	—	—	—
4.	*Trichadenotecnum sexpunctatum* (L.) ..	×	—	×	—	—	—
5.	,, *major* (Kolbe) ...	—	×	×	—	×	—
6.	*Loensia fasciata* (F.)	—	—	×	×	×	—
7.	,, *variegata* (Latr.)	×	×	×	—	×	—
8.	,, *pearmani* Kimmins	—	?	?	—	—	—
9.	*Amphigerontia bifasciata* (Latr.) ...	—	×	×	×	×	—
10.	,, *contaminata* (St.) ...	—	—	×	×	—	—
11.	*Euclismia quadrimaculata* (Latr.) ...	×	—	×	—	×	—
12.	*Clematostigma morio* (Latr.)	×	—	×	—	×	—
	STENOPSOCIDAE.						
13.	*Graphopsocus cruciatus* (L.)	×	×	×	×	×	—
14.	*Stenopsocus stigmaticus* (Imh.) ...	—	—	×	—	×	—
15.	,, *immaculatus* (St.)	—	×	×	×	—	—
	POLYPSOCIDAE.						
16.	*Reuterella helvimacula* End.	—	×	×	—	×	—
17.	*Bertkauia lucifuga* (Ramb.)	—	—	—	—	—	—
	CAECILIIDAE.						
18.	*Kolbia quisquiliarum* Bertk.	—	—	×	—	—	—
19.	*Trichopsocus* sp.	—	—	×	—	—	—
20.	,, *dalii* McL.	×	—	×	×	×	—
21.	*Chaetopsocus richardsi* Pearm.* ...	—	—	—	—	—	—
22.	*Caecilius fuscopterus* (Latr.)	×	×	×	×	×	—
23.	,, *flavidus* (St.)	×	×	×	×	×	—
24.	,, *atricornis* McL.	×	—	×	—	×	—
25.	,, *piceus* Kolbe v. *brevipennis* End.	—	—	×	—	—	—
26.	,, *burmeisteri* Brauer	—	×	×	×	×	—
27.	,, *kolbei* Tet.	—	—	—	—	—	—

No.	Species	Kent, E.	Kent, W.	Surrey.	Sussex, E.	Sussex, W	
28.	*Enderleinella obsoleta* (St.)	—	—	×	×	×	—
29.	*Lachesilla pedicularia* (L.)	×	×	×	×	×	—
30.	,, *livida* End.	—	—	—	—	—	—
31.	*Terracaecilius greeni* Pearm.	—	—	×	—	—	—
	Peripsocidae.						
32.	*Peripsocus phaeopterus* (St.)	—	×	×	×	×	—
33.	,, *parvulus* Kolbe	—	—	—	—	—	—
34.	,, *alboguttatus* (Dalm.) ...	—	×	×	—	—	—
35.	,, *subfasciatus* (Ramb.) ...	—	—	×	—	—	—
36.	*Ectopsocus briggsi* McL.	×	×	×	—	×	—
37.	,, *borealis* Harrison	—	—	—	—	—	—
	Mesopsocidae.						
38.	*Mesopsocus unipunctatus* (Müll.) ...	—	×	×	×	×	—
39.	,, *immunis* (St.)	—	×	×	—	—	—
40.	,, *laticeps* (Kolbe)	—	—	—	—	—	—
41.	*Elipsocus consimilis* McL.	—	—	×	—	—	—
42.	,, *cyanops* Rost.	—	×	×	—	—	—
43.	,, *hyalinus* (St.)	×	×	×	×	×	—
44.	,, *westwoodi* McL.	×	×	×	×	×	—
45.	,, *mclachlani* Kimmins	×	—	×	—	×	—
46.	*Philotarsus picicornis* (F.)	—	×	×	—	×	—
47.	*Pseudopsocus rostocki* Kolbe	—	×	×	—	—	—
48.	,, *fusciceps* (Reut.) ...	—	—	—	—	—	—
	Liposcelidae.						
49.	*Embidopsocus enderleini* Rib.	—	—	—	—	—	—
50.	,, *minor* (Pearm.)* ...	—	—	—	—	—	—
51.	*Liposcelis divinatorius* (Müll.)	—	—	×	×	×	—
52.	,, *bicolor* Bks.	—	—	—	—	—	—
	,, ,, v. *decolor* Pearm. ...	—	—	—	—	—	—
53.	,, *virgulatus* Pearm.*	—	—	—	—	—	—
54.	,, *meridionalis* Rosen (1) ...	—	—	—	—	—	—
55.	,, *formicarius* (Hag.)	—	—	×	—	—	—
	Psyllipsocidae.						
56.	*Psyllipsocus ramburi* Selys	—	—	×	—	—	—
57.	*Rhyopsocopsis peregrinus* Pearm.* ...	—	—	—	—	—	—
58.	*Deipnopsocus spheciophilus* End. v. *disparilis* Pearm.*	—	—	—	—	—	—
	Empheriidae.						
59.	*Psoquilla marginepunctata* Hag. ...	—	—	—	—	—	—
	Trogiidae.						
60.	*Tapinella castanea* Pearm.	—	—	—	—	—	—
61.	*Lepinotus inquilinus* Heyd.	—	×	×	×	×	—
62.	,, *patruelis* Pearm.	—	—	×	—	—	—
63.	,, *reticulatus* End.(2)	—	—	—	—	—	—
64.	*Trogium pulsatorium* (L.)	—	×	×	×	×	—
65.	*Myopsocnema annulata* (Hag.)	—	×	×	—	—	—
66.	*Hyperetes brittanicus* Harr.	—	—	—	—	—	—
67.	,, *guestfalicus* Kolbe	×	×	×	×	×	—
	Lepidopsocidae.						
68.	*Lepidilla kelloggi* Rib.	—	—	×	×	—	—

* Warehouse species, probably imported.

(1, 2) Species new to Britain, Pearman, *in litt.*, 12.xi.40.

In conclusion, it may be useful to point out certain instances in which the present list differs from Pearman's (other than changes in generic names).

Amphigerontia contaminata (Steph.).

This species (together with *L. picicornis*) was reinstated on the British list after a long period of synonymy by Pearman in 1932 (*Ent. mon. Mag.*, **68**: 193-204).

Loensia pearmani nom. nov. (for *L. picicornis* (St.)).

Psocus picicornis Stephens, 1836, *Ill. Brit. Ent.*, *Mand.*, **6**: 118.
Loensia picicornis Pearman, 1932, *Ent. mon. Mag.*, **68**: 194.

This change of name has been necessitated by the fact that *Ps. picicornis* Stephens is not the same as *Ps. picicornis* of Fabricius.

Chaetopsocus richardsi Pearman.

1929, *Ent. mon. Mag.*, **65**: 104-9. Among West African cacao, in a warehouse.

Caecilius perlatus Klbe.

This species has been placed in the synonymy of *Enderleinella obsoleta* (Steph.).

Lachesilla livida Enderlein.

Bagnall, 1915, *Ent. Rec.*, **27**: 229-30.

Pterodela quercus Klbe.

Mr. Pearman has informed me that this species was erroneously introduced to the British list, his specimens being a variety of *Lachesilla pedicularia* (L.).

Terracaecilius greeni Pearman.

1933, *Ent. mon. Mag.*, **59**: 81-3.

Peripsocus subpupillatus McL.

Synonym of *P. subfasciatus* (Ramb.).

Peripsocus parvulus Klbe.

McLachlan, 1890, *Ent. mon. Mag.*, **26**: 269-70.

Ectopsocus borealis Harrison.

This name was proposed for the northern form of *E. briggsi* with unspotted wings (1916, *Entomologist*, **49**: 134-5).

Mesopsocus immunis (Stephens).

I believe this species was reinstated by A. Ball in 1937, *Bull. Mus. Hist. nat. Belg.*, **13** (42): 1-11, but his paper is temporarily inaccessible to me.

Mesopsocus laticeps (Klbe.).

Gambles, 1933, *Ent. mon. Mag.*, **69**: 224-6.

Elipsocus consimilis McLachlan.

1890, *Ent. mon. Mag.*, **26**: 269-70. This may prove to be a form of *E. cyanops* Rost.

Elipsocus abietis Klbe.

I consider this to be a synonym of *E. hyalinus* Steph. *nec* McL.

Elipsocus mclachlani Kimmins.
1941, *Ann. Mag. N.H.* (11) **7**: 528, fig. 5.
This name has been proposed for the small yellow-bodied species called '*hyalinus* Steph.' by McLachlan and others.

Philotarsus picicornis (Fabricius).
Kolbe, in his description of the genus *Philotarsus,* includes only one species, *Ph. picicornis* F., and quotes *flaviceps* Stephens as a synonym. Unfortunately subsequent workers, including even Kolbe himself, have overlooked or ignored this fixation of the genotype, which has generally been given as *flaviceps* Stephens.

Pseudopsocus fusciceps (Reuter).
Harrison, 1923, *Vasculum,* **9**: 62 (as *Leptella fusciceps*).

Embidopsocus enderleini Ribaga.
Embidotroctes rectivenis Pearman is a synonym (Pearman, 1935, *Ent. mon. Mag.,* **71**: 82-5).

Embidopsocus minor (Pearman).
1931, *Ent. mon. Mag.,* **67**: 95-8 (*Stenotroctes*). Among West African cacao, in a warehouse.

Liposcelis virgulatus Pearman.
1929, *Ent. mon. Mag.,* **65**: 104-9. Among West African cacao, in a warehouse.

Liposcelis meridionalis Rosen.
Mr. Pearman informs me that he has seen examples from the Scilly Islands, and the species should therefore be added to the British list.

Nymphopsocus destructor End.
Brachypterous form of *Psyllipsocus ramburi* Selys (Pearman, 1935, *Ent. mon. Mag.,* **71**: 82-5).

Rhyopsocopsis peregrinus Pearman.
1929, *Ent. mon. Mag.,* **65**: 104-9. In a banana store.

Deipnopsocus spheciophilus End., var. *disparilis* Pearman.
1931, *Ent. mon. Mag.,* **67**: 95-8. In Accra cacao.

Tapinella castanea Pearman.
1932, *Stylops,* **1**: 240-2. Among Canary bananas.

Lepinotus patruelis Pearman.
1931, *Ent. mon. Mag.,* **67**: 47-50. A common domestic and storehouse Psocid.

Lepinotus reticulatus Enderlein.
Mr. Pearman informs me that he has seen examples from a London warehouse, and the species should therefore be added to the British list.

Lepidilla kelloggi Ribaga.
Pteroxanium squamosus End. is a synonym.

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LEPIDILLA KELLOGGI Ribaga (Psocoptera) IN WESTMORLAND.

By D. E. KIMMINS

(Dept. of Entomology, British Museum, Nat. Hist.).

Since my note on the occurrence of this species in the Leith Hill district of Surrey was drafted, Dr. K. G. Blair has informed me that he took examples at Glenridding, Ulleswater, Westmorland, in August, 1929. As this appears to be the first record for Westmorland, Dr. Blair suggested that I should add a paragraph to my note. It seems advisable, however, to deal with it under a separate heading.

LEPIDILLA KELLOGGI Rib. and *CAECILIUS PICEUS* Rib., var. *BREVIPENNIS* End., in SURREY (Psocoptera).

By D. E. KIMMINS

(Dept. of Entomology, British Museum, Nat. Hist.).

On Sunday last (Oct. 13th, 1940), whilst collecting Psocoptera in the neighbourhood of Leith Hill, I was fortunate in taking a number of examples of *Lepidilla kelloggi* Ribaga (= *Pteroxanium squamosum* End.), an interesting brachypterous Psocid, whose body and wings bear scales as well as hairs. They were beaten from an old gorse bush in a rather moist valley, where they were doubtless feeding on Pleurococci on the stems and seed-pods of the gorse. Examination of neighbouring bushes failed to produce any more examples, although they seemed equally suitable. These psocids are very agile, even for Psocoptera, running in short spurts and jumping for short distances. I believe that this is the second locality for Surrey, Pearman (1933) recording it from Camberley, but it has not previously been taken from gorse.

From the same gorse bush I also secured a short series of var. *brevipennis* End., of *Caecilius piceus* Kolbe, a small dark

brachypterous insect. All the examples were females and I did not find any full-winged specimens, although *C. burmeisteri* occurred in plenty. Var. *brevipennis* was quite conspicuous on the beating-tray, its dark brown head and dark reddish abdomen giving it the appearance of a minute beetle. The reduced wings vary in length in different individuals, extending from about one-half to three-quarters of the length of the abdomen.

Some of the specimens were kept alive, and a day or so later a batch of four eggs was deposited in a hollow on the outer sheath of a seed-pod. They are pearly-white when first laid, elongate, nearly twice as long as broad, with bluntly rounded ends, one end slightly narrower than the other. Over the eggs is spread a fine silken web, loosely and openly woven, so that the eggs are clearly visible beneath it, the threads running in all directions. Subsequently the eggs darkened to violet-black, strongly iridescent.

PEARMAN, J. V. 1933. Further notes on *Lepidilla kelloggi* Ribaga. *Ent. mon. Mag.*, **69**: 22.

THE HEMIPTERA—HOMOPTERA (*Auchenorhyncha*) ASSOCIATED WITH CULTIVATED FRUITS.

By A. M. MASSEE, D.Sc.

INTRODUCTION.

Several species of leaf hoppers have been considered important pests of agricultural and market garden crops for many years, especially on plants growing under glasshouse conditions; it is, therefore, surprising that the species associated with cultivated fruits have been so much neglected in the past. The reason for this is not obvious. It may be that collectors do not have access to fruit plantations, and that the economic entomologist has not cared to study these insects, which are considered to be a difficult group, both from the point of view of naming and rearing. Nevertheless several species are known to occur on fruit trees, and the characteristic leaf markings made by these insects are very conspicuous in the summer and autumn months.

As already mentioned, research workers of this country have not interested themselves in fruit leaf hoppers to any great extent. Ormerod does not refer to them at all in any of her numerous publications on fruit pests. Curtis (1860) and Buckton (1891) refer to only one species which they state caused considerable injury to the foliage of the cultivated hop. Some years later Theobald (1907) refers to three species which he found infesting the apple, plum and damson. These species are described in some detail, together with notes on their life-cycle and sug-

gestions for their control. Two years later Theobald (1909) again refers to the same species in his well-known work entitled 'Insect Pests of Fruit.' His remarks, however, are mainly a repetition of his report of 1907. Notes on the oviposition of two species of plum leaf hoppers are outlined by Massee (1929), and the same writer (1940) records the presence of an Australian leaf hopper infesting apple in Kent.

The scanty literature concerning our fruit leaf hoppers is very surprising, in view of the importance of these insects at home and abroad. For example, several well-known species of America and Australia are regarded as serious pests of apple and other fruits, and much has been published about a few economic species abroad during the past twenty-five years.

In the present paper it is proposed to record the species of leaf hoppers actually associated with cultivated fruits and hops. Every effort has been made to ascertain that all the species referred to do actually live and feed upon the host plants given in the list. In order to attain this purpose, it has been necessary to breed some of the species before a correct determination could be made. In each case the determination has been made on the examination of the aedeagus, and to achieve this the recent Monograph by Ribaut (1936) and the notes by Edwards, published periodically in the *Entomologist's Monthly Magazine,* have proved indispensable.

In the meanwhile, it is interesting to note that forty species of leaf hoppers are now known to be associated with cultivated fruits and hops. Whereas Theobald and his contemporaries mention only seven species, some of them quite casually, only brief remarks are given concerning their host plants.

The Species of Leaf Hoppers and Frog Hoppers Associated with Cultivated Fruits and Hops.

(Arranged under host plants.)

APPLE

(including Crab Apple).

TYPHLOCYBA
avellanae Edw.
rosae (L.)
froggatti Baker.
debilis Dgl.
quercus (F.).

ERYTHRONEURA
mali Edw.
(Edwards, 1915).*

EMPOASCA
flavescens (F.).
decipiens Paoli.

ALEBRA
wahlbergi (Boh.).

CERCOPIS
sanguinea Geoffr.

LEDRA
aurita L.

* When reference in brackets follows the species name, it indicates that the species in question has not been noted on fruit by the writer.

Although nine species of leaf hoppers and two species of frog hoppers occur on apple, some of them are uncommon and must be regarded as occasional visitors, frequenting the apple only as an additional host.

The species commonly found on apple are *T. rosae*, *T. froggatti*, *T. debilis*, *T. quercus*, *E. flavescens* and *E. decipiens*. Until recently *T. rosae* and *T. debilis* were considered to be the two common species, but in 1940 *T. froggatti* proved to be very abundant on several sorts of fruit, and is now regarded as the most prevalent species in the Maidstone district. *T. froggatti* was originally found in Australia by Froggatt (1918) on apple foliage. It is referred to later by Baker (1925). The first record of this species occurring in Europe is made by Ribaut (1936) in his Monograph on the Typhlocybidae. China (1939) and Brown (1940) noted its occurrence in Great Britain, and more recently it was recorded by Massee (1940) as the most prevalent species on apple and plum in the Maidstone district.

E. mali is recorded by Edwards (1915) and the host plant given is apple. The species has not been noted since on cultivated fruit.

L. aurita is usually associated with oak; it is therefore of interest to record it feeding on apple foliage in a derelict orchard at East Malling. More recently (1935) it turned up again, this time on some well cared for apple trees at East Malling. The nymphs feed on apple foliage in captivity, but it is not known whether they seek other food in addition to apple foliage in the plantation. Altogether this frog hopper has been recorded on apple on five occasions.

Another species of frog hopper which feeds quite readily on apple foliage is *C. sanguinea*. It has occurred for a number of seasons, in May and June, in a mixed apple and pear orchard at Tenterden, Kent. Only the adults feed upon the foliage, producing brown angular leaf markings, which are conspicuous on both surfaces of the foliage. Wormald (1940) and other mycologists have referred to this kind of leaf injury, which was at first attributed to a fungus found on the spots, and has been given the popular name of angular leaf spot. It is now generally agreed that *C. sanguinea* is responsible for the damage, and that angular leaf spot is not caused by a fungus.

In 1940 the adults of *C. sanguinea* were noted feeding on many kinds of fruit in May and June, and in addition there is evidence to show that the adults feed indiscriminately on many kinds of trees and shrubs. The immature stage is associated with the roots of dock.

CHERRY

(sweet and sour varieties).

TYPHLOCYBA
quercus (F.).

ERYTHRONEURA
flammigera (Geoffr.).
alneti (Dhlb.).

EMPOASCA
decipiens Paoli.

EUPTERYX
stellulata (Burm.).

CERCOPIS
sanguinea Geoffr.

Five species of leaf hoppers have been noted feeding on the foliage of sweet and sour cherries, but only one species is common and generally distributed. It is *E. stellulata,* a very handsome species, which proved to be very abundant at Maidstone and Southfleet in the summer of 1940. It would seem that this hopper is more common on fruit trees now than it used to be. Theobald does not refer to it, and it seems unlikely that he could have overlooked such a conspicuous insect.

T. quercus is usually present in small numbers on most kinds of cultivated fruits. The cherry is no exception. The insect does not appear to cause any harm to the trees, and it just persists season after season without increasing unduly. The other species on cherry do not call for any special remarks.

CURRANT

(Red, White and Black).

TYPHLOCYBA
prunicola Edw.

CERCOPIS
sanguinea Geoffr.

PHILAENUS
leucophthalmus L.

The only leaf hopper found breeding on red, white and black currants is *T. prunicola,* and it is abundant in the late summer and autumn months. One might have expected to find *T. rosae* feeding on currant, but it has not been noted.

P. leucophthalmus is very common on currant in some seasons, but it does not cause any damage to the growth of the bushes or reduce the crop.

FIG

TYPHLOCYBA
ulmi (L.)
debilis Dgl.
quercus (F.).

EMPOASCA
flavescens (F.)

EUPTERYX
aurata (L.)

Little comment is necessary concerning the five species of hoppers found on fig. *T. debilis* is the most common species in the Maidstone district, and the leaf markings made by this insect are very conspicuous by the end of the summer. This hopper is also partial to the fruits of the fig.

E. aurata is especially common in the autumn, and frequently causes damage to figs growing under glass.

GOOSEBERRY

TYPHLOCYBA
rosae (L.).

EMPOASCA
decipiens Paoli.

It is possible that the texture of the gooseberry foliage renders it distasteful to leaf hoppers, because very few species are found on this soft fruit, and they are never very abundant.

The common species is *T. rosae* in the Maidstone district, but its place is taken by *E. decipiens* in North Kent.

MEDLAR

TYPHLOCYBA
rosae (L.).
quercus (F.).

EMPOASCA
decipiens Paoli.

Since the medlar is grown singly in private gardens, and not in numbers in orchards, it has not been possible to examine many trees. Leaf hoppers have been collected from about a dozen trees and three species appear to be always present. *T. rosae* is very common, while *T. quercus* and *E. decipiens* occur in smaller numbers.

MULBERRY

TYPHLOCYBA
rosae (L.).
quercus (L.).

Both *T. rosae* and *T. quercus* are equally common on mulberry, and they are present throughout the summer months. Leaf mottling is very pronounced by the autumn, and the dense foliage of the mulberry affords ample protection for the leaf hoppers in unkindly weather.

NUT

(Cob and Filbert).

TYPHLOCYBA
douglasi Edw.
(Ribaut, 1936).
avellanae Edw.
rosae (L.)
spinigera Edw.
(Edwards, 1924).
lethierryi Edw.
tenerrima H.-S.
quercus (F.).

ERYTHRONEURA
angusta (Leth.)
(Ribaut, 1936).
tiliae (Geoffr.)
(Ribaut, 1936).
parvula (Boh.)
(Ribaut, 1936).

EMPOASCA
decipiens Paoli.

ALEBRA
wahlbergi (Boh.).

Next to the plum, the cultivated nut supports more species of leaf hoppers than any other fruit. Twelve species are recorded upon this bush fruit. Many species doubtless feed upon the nut as an additional host plant, but others seem to be entirely confined to nut.

The commonest species are *T. avellanae, T. rosae, T. quercus* and *A. wahlbergi.*

Edwards (1924) recorded *T. spinigera* on hazel, but so far it has not been noted on cultivated nut.

Ribaut (1936) records four species, all of which occur in the British Isles, on hazel, but so far they have not been noted on the nut or filbert in this country.

PEACH

(including Nectarine and Apricot).

TYPHLOCYBA
rosae (L.).
rosae (L.)
abb. *manca* Rib.
barbata Rib.
quercus (F.).

EMPOASCA
decipiens Paoli.

Although peaches growing under glass are more subject to attack by leaf hoppers than those growing in the open, fan-trained trees on walls often suffer severely.

The common species is *T. rosae,* and in some seasons it is numerous enough partly to defoliate the trees. The abberation *T. rosae* abb. *manca* is sometimes present with the type form. Another interesting species on peach is *T. barbata,* a species which is new to the British list.

T. quercus and *E. decipiens* are sometimes quite common, but rarely cause any damage to the trees.

PEAR

TYPHLOCYBA
quercus (F.).

EUPTERYX
stellulata (Burm.).

CERCOPIS
sanguinea Geoffr.

Very few species of leaf hopper occur on pear, and those which do feed on the foliage are never common.

E. stellulata is the most prevalent, but it is not so numerous on pear as on cherry. The conspicuous nymphs can be seen feeding on the under surfaces of the leaves in the summer months.

T. quercus lives and feeds on some varieties of pear, but it is never very common.

C. sanguinea occurs on pear in addition to the apple, and in fact it causes more harm to pear than apple, because it feeds on the developing fruitlets, whereas it only attacks the foliage of the apple. The most severe infestation was noted at Tenterden, Kent. The adult hoppers were feeding on the stalks and developing fruits, causing conspicuous markings and russeting. As the fruits grow out they become misshapen and covered with pock marks. The crop was rendered useless.

PLUM

(including Damson).

TYPHLOCYBA
- *staminata* Rib.
- *rosae* (L.).
- *rosae* (L.) abb. *manca* Rib.
- *froggatti* Baker.
- *solearis* Rib.
- *barbata* Rib.
- *hippocastani* Edw.
- *ulmi* (L.).
- *cruciata* Rib.
- *debilis* Dgl.
- *quercus* (F.).
- *prunicola* Edw.

ERYTHRONEURA
- *angusta* (Leth.).
- *flammigera* (Geoffr.).
- *pruni* (Edw.).
- *alneti* (Dhlb.).
- *coryli* (Tollin).

EUPTERYX
- *stellulata* (Burm.).

EMPOASCA
- *smaragdula* (Fall.).
- *flavescens* (F.) (Theobald, 1907).
- *decipiens* Paoli (Theobald, 1907).

CERCOPIS
- *sanguinea* Geoffr.

Up to the present twenty species of leaf hoppers have been recorded on plum, which must be regarded as a favourite host of these insects.

Eleven species of the genus *Typhlocyba* are represented, and all with the exception of *T. cruciata* are quite common in the plum growing districts of Kent. *T. rosae, T. froggatti, T. debilis, T. quercus* and *T. prunicola* are sometimes very abundant, causing certain varieties of plum to shed their foliage prematurely. *T. solearis* and *T. barbata,* which are locally common in the Maidstone area, have not hitherto been recorded as British insects.

Five species of *Erythroneura* occur on plum and damson, the commonest being *E. flammigera* and *E. alneti.* A note on the oviposition of *E. alneti* on cherry plum has been published by Massee (1929).

E. stellulata is abundant on plum at the end of May and in June, particularly so in the Southfleet district of Kent, but it does not seem to be harmful to the trees.

Three species of *Empoasca* occur on plum, and the habits of two of them — *E. flavescens* and *E. decipiens* — have been described in some detail by Theobald (1907).

The adult of *C. sanguinea* feeds on plum foliage in June, causing brown angular leaf markings, but it has not been noted feeding on the developing fruitlets.

QUINCE

TYPHLOCYBA
froggatti Baker.

At present only one species of leaf hopper has been observed feeding on quince, but there is little doubt that several of the apple and pear species will turn up on quince.

It is curious that *T. rosae,* a species which feeds on most kinds of fruit, has not yet been recorded on quince.

RUBUS

(Blackberry, Loganberry, Himalaya Berry and Raspberry).

TYPHLOCYBA
- *rosae* (L.).
- *aurovittata* Dgl. (Ribaut, 1936).
- *debilis* Dgl.
- *tenerrima* H.-S.
- *prunicola* Edw.
- *pruni* Edw.

ERYTHRONEURA
- *angusta* var. *moesta* (Ferr.).
- *angusta* (Leth.) (Ribaut, 1936).
- *tiliae* (Geoffr.) (Ribaut, 1936).

EMPOASCA
- *flavescens* (F.).

PHILAENUS
- *leucophthalmus* L.

Ten species of leaf hoppers have been recorded on cultivated *Rubus,* and doubtless many more species occur on these soft fruits. Some sorts, such as the cultivated blackberries, retain their foliage for most of the year, thus affording ample shelter for the leaf hoppers in the winter months. Some species which hibernate in the adult stage, migrate from their summer host plants in the autumn and establish themselves on blackberry and other Rubi.

The three most common species of *Typhlocyba* are *T. debilis, T. tenerrima* and *T. rosae*. *T. aurovittata* is recorded on blackberry by Ribaut (1936), but it has not yet been found on this host plant in this country.

Three species of *Erythroneura* are recorded on *Rubus,* but only one of them, *E. angusta* var. *moesta,* has been noted on *Rubus* in England. *E. flavescens* hibernates on cultivated and wild blackberry—in addition to other evergreens—but it is not commonly found on *Rubus* in the summer months.

P. leucophthalmus is always to be found on *Rubus*, and the immature stage is very partial to the young shoots of loganberry, blackberry and the Himalaya berry.

Some notes on the species of leaf hoppers associated with cultivated *Rubus* are outlined by Dicker (1939), and one species of frog hopper is also mentioned.

STRAWBERRY

TYPHLOCYBA
rosae (L.).
quercus (F.).

CERCOPIS
sanguinea Geoffr.

PHILAENUS
leucophthalmus L.

A very careful search has been made for leaf hoppers on strawberry during the past five years, but at present only two very common species have been found. *T. rosae* is always common, but it does not seem to injure the plants. Attempts to transmit the well-known strawberry virus diseases by means of *T. rosae* have not proved successful.

C. sanguinea and *P. leucophthalmus* both feed on the foliage of strawberry, the former causing the familiar angular leaf markings already referred to on apple.

HOP

TYPHLOCYBA
rosae (L.).
hippocastani Edw.
debilis Dgl.
quercus (F.).

EUPTERYX
atropunctata (Goeze)
(Curtis, 1860), (Buckton, 1891).
stellulata (Burm.).

EMPOASCA
flavescens (F.).

PHILAENUS
leucophthalmus L.

EUACANTHUS
interruptus L.

Seven species of leaf hoppers have been noted on hops in different parts of Kent, but their distribution is very uneven.

In the Maidstone district *T. debilis*, *T. hippocastani* and *T. rosae* are most frequently met with, whereas *E. flavescens* appears to be the common species in the Paddock Wood area.

E. stellulata occurs sparingly on hop but it is never very common.

E. atropunctata is recorded on hop by Curtis (1860) and later by Buckton (1891), but it has not been noted on this host by the writer.

E. interruptus frequently infests the hop and often causes considerable damage by checking the growth of the bines. It

occurs in the same hop gardens year after year. Details of the damage caused to hop by this frog hopper have been described by Theobald (1925) and Massee (1937).

Leaf hoppers recorded on fruit in France by Ribaut, but not found in this country.

	Host Plant.
TYPHLOCYBA	
ficaria Horv. - - -	Fig.
ERYTHRONEURA	
discolor (Horv.) - -	Plum, *Rubus*.
rhamni (Ferr.) - - -	*Rubus*.
simplex (Ferr.) - -	*Rubus*.
lunaris (M.R.) - - -	*Rubus*.
eburnea (Fieb.) - -	*Rubus*.
bisignata (M.R.). - -	Apple, plum, *Rubus*.
sanguinea (Rey.) - -	Plum.
erecta Rib. - - -	Nut.

The list of leaf hoppers recorded on fruit in France by Ribaut, but not yet found in this country, is given for the sake of completeness, because it seems reasonable to suggest that some of them at least will eventually be found in these islands.

Acknowledgement.

The writer wishes to thank Mr. W. E. China, M.A., for his ever ready assistance in determining some of the species.

Summary.

Brief notes are given for the forty species of leaf hoppers observed to breed on, or to be associated with, cultivated fruits.

The species are arranged under host plants, and more detailed notes are given of the economic species.

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OXYCERA DIVES Loew and *XANTHANDRUS COMTUS* Harris (Dipt.) IN LANARKSHIRE.

By W. A. Galbraith, M.B., Ch.B.

Oxycera dives Loew. has been so rarely recorded from Britain that a note of its capture in Lanarkshire may be of some interest. On 23rd July, 1940, I took a female at rest on a bramble leaf near Garrion Bridge on the River Clyde. The locality is a marshy one on the north bank of the river, and the specimen was taken within a few feet of the water. A close search of the surrounding vegetation was fruitless, and I was unable to visit the locality again.

Xanthandrus comtus is rare in Scotland and has only twice been recorded. In the course of several years' collecting of Syrphidae I did not meet with it until on May 27th, 1940, I was surprised to capture a female at rest on a leaf. A second female was taken on 31st August, 1940, a more normal date, the species being autumnal. The spring specimen is much darker in colour and the abdominal spots much reduced. I saw the second specimen alight on a leaf near me, and it immediately moved under it with the curious sideways movement one sees in *Melanostoma*. Both specimens were taken in a wood near my house.

HISTORICAL, BIOLOGICAL AND ECOLOGICAL NOTES ON *ISCHNURA PUMILIO* (Charp.) (Odonata).

By Lt.-Col. F. C. Fraser, I.M.S. (Retd.), F.R.E.S.

In a former paper which appeared in this *Journal* (1940, **2**: 45-53) I commented upon the appearances and disappearances of the British dragonfly *Oxygastra curtisii* (Dale). A parallel case is provided by *Ischnura pumilio* (Charp.), another British dragonfly, but belonging to the sub-order Zygoptera. The earliest records of this species as a British insect, which I have been able to trace, are contained in letters which passed between the two Dales (J.C. and C.W.) and the late R. MacLachlan. C. W. Dale states that his father took *pumilio* near Lyndhurst in the New Forest in August, 1820; at Parley Heath, near Christchurch, 18 June, 1824; at Knighton Heath, near Dorchester, July, 1835; and at Glanvilles Wootton, 17 August, 1859. He and his father took it in numbers in a bog about half-way between Penzance and Land's End, August, 1864, and he himself at Lodmore, near Weymouth, May, 1887. But *pumilio* was not described by Charpentier until 1825, so that if the date of 1820 is correct, the species was initially discovered in these islands. In one of J. C. Dale's letters, he says that he had a specimen in his cabinet for some years without data, but which he believed he had taken at Glanvilles Wootton. He makes no mention of the Lyndhurst specimen cited above. Of these dates, that of May is too early and that of August rather late, so that it is possible, and indeed very probable, that these particular specimens were wrong identifications for *I. elegans*. Lucas gives the incidence of the imago as from June to September, but the latter month is quite out of the question, the species usually being quite over by the end of July. In the Dale collection are two specimens of *I. elegans* labelled as *pumilio* from Cornwall. Others, correctly labelled as *pumilio* but without further data, are six males, one female from Land's End, August, 1864 (C.W.D.); one female from the New Forest (J.C.D.); two males, two females (J.C.D.); one female, Dorchester (J.C.D.); and one male, New Forest, 3 July, 1842 (J.C.D.).

Doubleday gave 'gravel-pits at Epping,' but the habitat is most unlikely. Harcourt Bath recorded it from Stratford-on-Avon in 1887 but failed to repeat this locality in his Handbook, so that it is probable that he recognised later that the identification was an error. A record by the same author, from Parley Heath, was most certainly communicated to him by C. W. Dale, whilst his

record 'from a pond near Bournemouth' refers to Coy Pond. This again is most certainly based on a wrong identification, for I have observed this pond for many years, and whilst *I. elegans* is invariably present year after year, *I. pumilio* has never been observed. Some sixty or more years ago, when Coy Pond was in continuation of extensive marshes, this habitat might well have been a possible one. Parfitt's record from near Exeter was found by MacLachlan to be an erroneous identification of *I. elegans*.

Coming now to more recent times, we have Mr. Atlee's records from Surrey, the exact locality not cited, but the date 26 May, 1931, and again in 1932, when he states that it was common. I have not seen these specimens but I am inclined to suspect that the identification was incorrect. He also took it near Brockenhurst, in the New Forest (at a tiny runnel).

Mr. Lucas's captures in the New Forest are, however, more important as they were taken over a number of years and the identification was confirmed by Messrs. Morton and Porritt. Lucas first found it in 1901 and from that year onwards to 1907. From that year it appears to have eluded him, for in 1926 he confessed that he thought it now extinct in the New Forest. His earliest date was 27 May and his latest 5 August. He communicated the locality to Porritt who, later, took it in considerable numbers. Mr. Morton had reason to believe that the locality was on the Avon Water, near Holmsley station, and I should consider this a very likely spot. A search in that neighbourhood, made by myself in 1930, proved fruitless, and I therefore decided to try further afield. My search was rewarded after two days by coming upon a large colony, and I took thirty specimens that year out of a great number seen. This colony has been under observation since by Dr. F. Haines, who has visited the spot year after year down to 1939, and has never once found it absent during that period, although its numbers have shown considerable fluctuation. No search was made for it in 1940, but from the inaccessible nature of the habitat, it is our considered opinion that there is no reason why the colony should not last for a great many years to come.

No mention has yet been made about Mr. Moore's records from Suffolk and of the host of localities given subsequently by Mr. Claude Morley. Mr. Moore's supposed captures were made on the Waveney River, Beccles, 26 July, 1935. Mr. Morley's records culled from labelled specimens previously identified as *I. elegans*, are from Oulton Broad, Barnby Broad, Covehithe Broad, Theberton Marshes, Tuddenham Fen and *even* in Monks Soham garden!! (The notes of exclamation are Mr. Morley's.) The identification of all these, including those of Mr. Moore, were made by Mr. Morley, and the latter has been requested by

Dr. Haines and myself repeatedly for the past three or four years to permit us to confirm his identifications. We have unfortunately met with nothing but evasive replies and latterly with no reply at all, so that taking into account the nature of the flight of his insects as described by Mr. Moore, the character of the habitat and the large number of habitats given by Mr. Morley, we have reluctantly come to the conclusion that a wrong identification has been made. This supposition has just been confirmed by the courtesy of Mr. Moore, who has sent me wings of his specimens. A glance at these proves without any shadow of doubt that they belong to *I. elegans* and not to *I. pumilio,* so that the Suffolk localities must be ruled out.

Ischnura pumilio is usually found in company with *C. mercuriale* and *C. tenellum.* Lucas found it so and this has been my experience. The association is of course due to the similarity of the habitats adopted by these insects. I have on two occasions found it in company with *I. elegans,* but the latter were few and far between and appeared to be out of place in their environment. *Pumilio* is essentially a creature of bog-land, and it especially favours runnels or brisk seepages on hill-sides meandering down into bogs. Its flight is sluggish and it hugs the ground closely, threading its way through the grass and sedges. In the teneral state, and nearly throughout in the female sex, it shelters up in thick scrub formed by bog myrtle. I have not been able to find the larva, probably because of the close and difficult nature of its aquain. A dredging net is useless, and, if it is to be eventually found, it will necessitate scooping up the mud and water by hand or by ladle, as I have been accustomed to search for anopheline larvae. The incidence of the imago is very variable from year to year, and may be from the last week in May to the first week in August; the end of June is the most favourable time to find it.

Identification of *I. pumilio* (Fig. 15, a to m.)

I do not know of any other British dragonfly which has offered so much difficulty in identification or over which so many errors in identification have been made. When compared with *I. elegans,* the species with which it has been constantly confused, so many differential points are found that it is difficult to assign the reason for these errors. Probably it is because stress has been laid purely on the character of the colouring of the hind segments of the abdomen, instead of taking more stable characters. The points of difference are given in the following table, but it may be stated here that *pumilio* may be recognised, in both sexes, by a mere glance at the shape and size of the pterostigmas of the fore- and hind-wings.

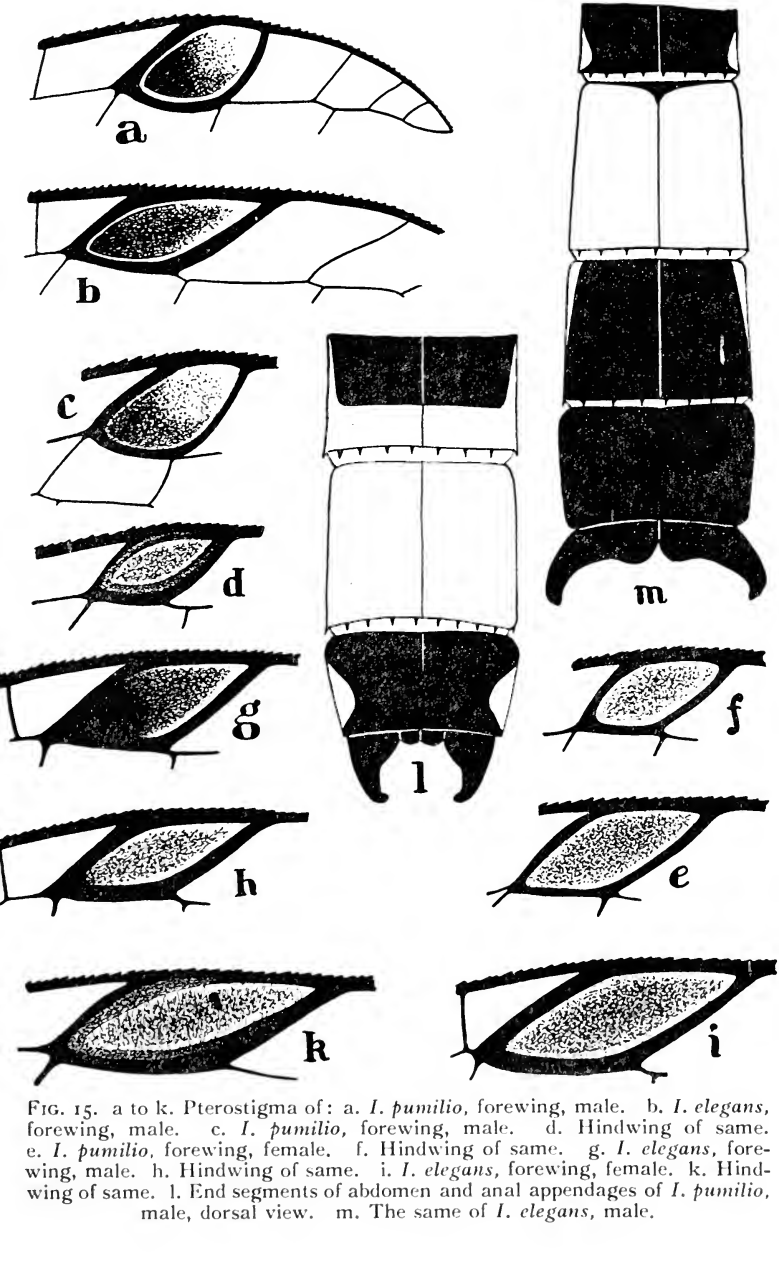

FIG. 15. a to k. Pterostigma of: a. *I. pumilio*, forewing, male. b. *I. elegans*, forewing, male. c. *I. pumilio*, forewing, male. d. Hindwing of same. e. *I. pumilio*, forewing, female. f. Hindwing of same. g. *I. elegans*, forewing, male. h. Hindwing of same. i. *I. elegans*, forewing, female. k. Hindwing of same. l. End segments of abdomen and anal appendages of *I. pumilio*, male, dorsal view. m. The same of *I. elegans*, male.

I. pumilio	*I. elegans*
Pterostigma of forewing nearly twice the size of that of the hindwing.	Pterostigmas of fore- and hind-wing of approximately the same size.
Pterostigma of forewing with costal side much shorter than all other sides; distal and proximal sides converging towards the costa.	Pterostigma with all sides approximately equal; distal and proximal sides parallel.
Pterostigma with its proximal area blackish often bordered outwardly with creamy yellow.	Pterostigma of forewing with its centre blackish, often pale bluish outwardly. The inner three-fourths may be entirely black in the forewing, but the black is always centralised in the hindwing.
Only the apical third or fourth of segment 8 of the male blue as viewed from the dorsum.	The whole of segment 8 of the male blue or a mere basal black line present.
Segment 9 entirely blue with a tiny irregular black sub-dorsal spot on each side, variably present.	Segment 9 entirely black as viewed from the dorsum.
Segment 10 with its sides blue only, this colour extending on each side on to the dorsum as an obtuse point.	Segment 10 usually entirely black as viewed from the dorsum: very rarely the blue of sides encroaching on the dorsum in tenerals.
Anal appendages of male forcipate, the apices converging slightly.	Anal appendages of male divaricate.
Female without blue markings on abdomen.	Female with segment 8 entirely blue or with but a narrow black basal line.
Female with pterostigma of hindwing very much smaller than that of forewing.	Female with pterostigma of hindwing but slightly smaller than that of forewing.
Habitat: shallow runnels in bogs.	Habitat: beside ponds and lakes or boggy spots bordering rivers.

I. pumilio has probably been a constant inhabitant of the New Forest over many years and there seems no reason why it should ever become extinct. Its territory, so far as known at present, appears limited to the valleys drained by the Avon Water and Oberwater, but it may be more widely spread than this. A number of other localities have been given from time to

time, including Belfast in Ireland and Kilmarnock in Scotland, but most of these are open to grave doubt and few, if any, of the identifications have been confirmed by specialists.

A good deal has been written about the 'red' or 'orange' varieties of the females of *pumilio* and *elegans,* but as a matter of fact it is these same pale coloured specimens which are the types, and the so-called 'heteromorphs.' The darkly marked specimens, which simulate the males more or less closely, are the real varieties or 'andromorphs.' Throughout this large genus we find the orange females, and it is beyond the bounds of coincidence that the same variety should have evolved in every species. The teneral males, on first emergence, are coloured similarly, so that it is evident that the orange coloured females represent the primitive state. This argument is strengthened by the fact that related genera exhibit the same coloured females, more especially those of *Agriocnemis* and *Argiocnemis.* In very old females there is a tendency for this orange colour to be lost and to be replaced by greenish and then bluish. In some species, especially in the nearly related *I. evansi* from Iraq, I have been able to obtain a complete series of females ranging from bright orange to others which are quite similar in colour and markings to the male.

There is a homogeneity among the various species of these orange females which does not exist in the males. Thus it is difficult to distinguish between the orange females of *I. elegans, senegalensis, evansi* and *bukharensis*; no such difficulty is met with in the case of the males. This fact in itself appears to me sufficient proof that the orange colouring is basic.

Following Selys, all subsequent authors, including Kirby and Lucas, have given *Agrion rubellum* Curtis (the type, a female) as a synonym for *Ischnura pumilio.* Curtis, however, described *rubellum* as having the end segments *fuscous.* This is correct for the female of *I. elegans* but not for *pumilio* in its teneral condition. In the coloured figure given by Curtis, these same segments are shown as distinctly *blue*; this again is correct for the adult female of *I. elegans* but not for that of *pumilio.* The nature of the habitats given by Curtis are those for *I. elegans.* Thus *Agrion rubellum* Curtis is a synonym for *I. elegans* (Lind.).

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TETRIX CEPEROI I. Bolivar IN BRITAIN (Orth.).

By K. G. Blair, D.Sc., F.R.E.S.

In compliance with Dr. Uvarov's request (*antea*, p. 75) I have examined the series standing as *T. subulata* in my collection and find it composed as follows, the determinations being confirmed by Dr. Uvarov :—

T. subulata.

Uxbridge, 21.v.26, 2 ♂♂; canal side.
Ashcott, Somerset, vi.33, 1 ♂; fenland.
nr. Hope Cove, S. Devon, ix.30, 3 ♀♀; situation not noted.

T. ceperoi.

Shanklin, I.W., iv.20, 1 ♀ ; undercliffs.
nr. Chale, I.W., ix.31, 2 ♂♂, 1 ♀ ; undercliffs.
Compton Bay, I.W., ix.31 and ix.34, 1 ♂, 1 ♀ ; cliffs.
Hordle Cliffs, Hants, ix.05, 2 ♀♀ ; cliffs, or heath above.
Charmouth, Dorset, vii.24, 1 ♂, 2 ♀♀ ; cliffs.
Croyde, N. Devon, iv.28, 1 ♂ ; sandhills.
Braunton, N. Devon, ix.29, 5 ♂♂, 2 ♀♀ ; sandhills.

These, so far as they go, would seem to indicate for *ceperoi* a preference for hot dry, sunny situations such as sandhills and broken cliff faces, while *subulata* seems to prefer a moister habitat. The localities given by Dr. Uvarov would bear this out, except for Lucas's record of what proves to be *ceperoi* from a damp situation in the New Forest.

ODONATA IN N.E. HANTS AND N.W. SURREY, 1940.

By A. W. Richards, M.A., B.Sc., F.R.G.S.

Emergences were very early this year, but with few exceptions the species were over earlier than usual. Owing to the war, some localities I have visited in previous years were inaccessible, and others greatly changed.

I have no doubt that I could have secured even earlier dates, as many of the first specimens were remarkably mature. Pre-occupation, except at week-ends, and the fact that I have been working out distribution, in consequence only visiting the best localities at intervals, are largely responsible. It is also unsafe to record dragonflies, especially some of the Anisoptera, unless they are settled nearby, or in the net.

My capture of the year was undoubtedly *Sympetrum flaveolum* (Linn.) at Fleet on 5th August. Although I kept a sharp look-out for some weeks subsequent to this, it was the only one which came to my notice.

The first and last dates are given, and if no note follows it is to be understood that the distribution and abundance was as in previous years.

Anisoptera.

C. boltonii (Don.). 6th June (Farnborough), 5th Aug. (Aldershot).

B. pratense (Müller). 18th May (Frimley Green), 26th June (Ash Vale).

Ae. cyanea (Müller). 29th June (Hawley), 12th Oct. (Fleet). On the latter date several females were ovipositing. They laid their eggs in the moss quite six inches above water level and two feet from the edge. The moss was damp, however, and during most of the year is thoroughly saturated.

Ae. juncea (Linn.). 5th Aug. (Elstead), 21st Sept. (Yateley).

Ae. grandis (Linn.). 22nd June (Aldershot), 28th Sept. (Yateley). This species was unusually abundant this year, occurring at every pond, including Bramshill Park and along the River Hart.

Ae. mixta (Latr.). 26th July (Ash Vale), 19th Oct. (Frimley Green). For the third year in succession this species was very common and widespread in the district. It certainly breeds at Fleet, Yateley, Elstead and Hawley, and at many places along the canal from Frimley Green to Dogmersfield.

A. imperator (Leach). 8th June (Aldershot), 2nd Sept. (Yateley). This species occurs in Alice Holt in addition to previously recorded localities.

C. aenea (Linn.). 12th May (Ash Vale), 26th July (Aldershot). This species breeds in Hawley Lake in addition to previously recorded localities.

S. metallica (V. der Lind.). 25th May (Frimley Green), 6th Aug. (Aldershot). This species was over earlier than usual but was very common. The female was met with all over the district; indeed, I was shown one caught by a boy in a Farnborough street. It breeds in the Basingstoke Canal and at Henley Park, and probably in Hawley Lake. I also found it in Alice Holt.

O. coerulescens (Fabr.). 2nd June (Elstead), 6th Sept. (Aldershot). The species breeds at Yateley.

O. cancellatum (Linn.). 7th June (Fleet), 26th Aug. (Bramshill). I did not see this species at the beginning of its emergence this year, but I found it in several new localities at Alice Holt and Bramshill Park.

L. quadrimaculata (Linn.). 9th May (Ash Vale), 24th Aug. (Aldershot). As usual, our commonest and most widespread member of the sub-order.

L. depressa (Linn.). 19th May (Alice Holt), 15th June (Fleet). Scarce this year.

S. s. striolatum (Charp.). 5th July (Aldershot), 19th Oct. (Yateley). This species was found in Bramshill Park.

S. sanguineum (Müller). 13th July (Frimley Green), 7th Sept. (Ash Vale). This species is common at Frimley Green, Mytchett, Ash Vale, Aldershot and Crookham, and on 5th Aug. I took a specimen at Fleet Pond.

S. flaveolum (Linn.). 5th Aug. (Fleet). A thorough search failed to reveal more than one specimen. This is the first I have taken. Its condition was perfect and the colours mature.

S. danae (Sulz.). 8th July (Yateley), 19th Oct. (Yateley).

ZYGOPTERA.

A. virgo (Linn.). 2nd June (Alice Holt), 12th Aug. (Elstead).

A. splendens (Harris). 8th June (Byfleet), 29th July (Elstead).

L. sponsa (Hans.). 10th June (Fleet), 9th Sept. (Fleet). The teneral specimen which I netted on 10th June must surely be nearly a record date for the country.

P. pennipes (Pall.). 8th June (Byfleet), 15th June (Swallowfield). This species occurs in Hants on the River Loddon but does not become common until further down in Berkshire, where I found var. *lactea* Steph.*

P. nymphula (Sulz.). 5th May (Hawley), 5th Aug. (Yateley).

I. elegans (V. der Lind.). 11th May (Aldershot), 1st Sept. (Crookham).

E. cyathigerum (Charp.). 9th May (Frimley Green), 21st Sept. (Aldershot).

C. puella (Linn.). 11th May (Alice Holt), 9th Aug. (Frimley Green). Rather variable in Alice Holt, and might be mistaken for *C. pulchella*.*

E. najas (Hans.). 13th May (Ash Vale), 6th Sept. (Bramshill). This species was quite common at the deep lake in Bramshill Park. Otherwise I have only found it on the Basingstoke Canal.*

P. tenella (Vill.). 11th June (Yateley), 19th Aug. (Yateley). I netted one specimen of this species by the canal at Aldershot.

SYMPETRUM FONSCOLOMBII (Selys) (Odon.) IN N.E. HANTS.

By A. W. RICHARDS, M.A., B.Sc., F.R.G.S.

On 2nd July, 1941, I came upon seven specimens of both sexes of this rare migrant at Hawley Lake. I captured two males and one female for my collection. The scarlet colouring of the males was bright, but the pterostigma were yellow, so that the insects were probably somewhat teneral. I observed

* *C. pulchella* is common all along the Basingstoke Canal.
E. najas is common at Virginia Water.
Var. *lactea* I regard as a mere teneral form of *pennipes*. Similar forms are found in all species of *Platycnemis* and the allied *Copera*.—F.C.F.

the insects on that and the following day for some time. They closely resemble *Sympetrum striolatum* in habits, returning to a particular perch again and again. One female evinced a decided preference for a fence wire, where she sat with outstretched, slightly depressed wings. As the shadows lengthened, one after another they flew up to the pine trees which bordered the path, where they presumably prefer to spend the night.

Subsequent days have shown that a fair number of specimens are about in different parts of the common around the lake. On 3rd July I saw 1 ♂ and 1 ♀, on 4th July 1 ♂, on 5th July 2 ♂♂, and on 6th July 3 ♂♂ and 4 ♀♀.

I have little hope, this year, of obtaining a female in the act of ovipositing, as all our great ponds, with the exception of the lake, have been drained. The lake is artificial, though large and crowded with bathers. There is only one shallow part where vegetation is luxuriant.

SYMPETRUM FONSCOLOMBII (Selys) (Odon.) IN EAST DORSET.

By F. J. Killington, D.Sc., A.L.S., F.R.E.S.

On the morning of 7th July, 1941, several bright red dragonflies of the genus *Sympetrum* were observed flying over and near a small heath pool on the northern outskirts of Poole. They had an unusual appearance, but unfortunately I had no net with me. A lucky stroke with a folded newspaper, however, knocked one to the ground, and I was pleased to find it was a fully matured specimen of the rare *S. fonscolombii*. A few females of the same genus were also seen, but as I could make no further capture I cannot vouch for their exact identity.

Other dragonflies present at the pool on the same occasion were *Aeshna juncea* (Linn.), *Anax imperator* Leach, *Libellula depressa* Linn. and immature *Sympetum danae* (Sulz.).

ANAX IMPERATOR Leach (Odon.) PREYING ON *PIERIS RAPAE* (Linn.) (Lep.).

By F. J. Killington, D.Sc., A.L.S., F.R.E.S.

On 23rd July, 1941, a male *Anax imperator* was seen to seize a female *Pieris rapae* as the latter was flying across a heath to the north of Poole, Dorset. The dragonfly settled on a small

sallow bush with its prey, and was so occupied with its captive that I was able to take it by hand. The head of the butterfly had disappeared and, presumably, had been eaten.

Anax imperator appears to be in good numbers in the Poole district this summer.

VOLUCELLA ZONARIA Poda, ♀ (Dipt., Syrphidae) IN DORSET.

By C. D. Day, M.A., L.M.S.S.A., D.P.H.

On 12th September, 1940, Miss Gene Dunlop called my attention to this fly, which was resting on the clothes line in my garden at 7 Weymouth Avenue, Dorchester. Not having a net with me, I caught it in my hand. The specimen was recognised as I had frequently taken it when stationed in Macedonia (Greece) during the last war. The specimen was sent fresh in laurel and unpinned to Mr. J. E. Collin, Newmarket, who has kindly confirmed the identification and says the only other British record with place and date appears to be that of a specimen taken by Dr. Sharp in the New Forest on 11.viii.1908 (Scott, H., 1923, *Ent. mon. Mag.*, **59**: 260).

LEPTIDEA SINAPIS (Linn.) (Lep.) IN HAMPSHIRE.

By J. Heath.

One freshly emerged male was taken on the wing in a fairly large mixed wood near Bursledon, Hants, during the afternoon of 11th May, 1940. This species has not been previously seen in these woods, and although a thorough search was made on several days, no further specimens were seen.

RANATRA LINEARIS Linn. (Hemipt.) IN SUSSEX.

By S. E. Hall.

After forty-five years of delving into ponds, I have at length succeeded in finding seven specimens in as many minutes.

On 26th June, 1941, I swept a small net through the weeds of a very small and shallow pool, about twelve feet long and six across, in Buxted Park, Sussex. This pool is fed from a lake in

the Park. The third sweep of the net brought to light one specimen, the remaining six being seen crawling about in two inches of water which was free from weeds.

R. linearis was reported as having been taken at Angmering, Sussex, when the Annual Congress of the South-Eastern Union of Scientific Societies was held at Worthing in 1938. Some few years ago the Zoological Society of London exhibited some specimens in the Insect House.

A second visit was made to the pool on 28th June and the water was thoroughly swept with a net, but not a single *linearis* was forthcoming.

Is this pond insect as rare as it has always seemed to me?

OBITUARY:

FREDERICK WALLACE EDWARDS,

M.A., SC.D., F.R.S., F.R.E.S., F.S.B.E.

By B. M. Hobby, M.A., D.Phil., F.R.E.S.

Dipterists the world over will mourn the passing of Dr. F. W. Edwards, on 15th November, 1940, after an operation. He was born at Fletton, Peterborough, on 28th November, 1888, and was educated at Cambridge County School and Christ's College, Cambridge. In 1910 he joined the staff of the British Museum (Natural History), and in 1937 became Deputy Keeper of the Department of Entomology, a most suitable appointment considering his kindness to visitors and correspondents. He became a Fellow of the Royal Entomological Society of London in 1911 and served on the Council 1929-31; he was also a Fellow of the Society for British Entomology. In 1938 his outstanding merit as a taxonomist gained for him the honour of election to the Royal Society. He specialised in the Nematocera, dealing chiefly with exotic Culicidae, but studying other families whenever an opportunity occurred, in particular paying much attention to the British fauna, where the need for an investigator of his calibre had long been felt. His capacity for work both in the field and in the Museum was enormous, although his apparently leisurely manner would deceive a casual acquaintance. Even in hospital he was still active, for on the day before the operation he was engaged on a revision of the British Mycetophilidae. With such energy it is no wonder that he is reputed to have described some 2,000 species and to have added another 500 to the British List. At one time or another (often with cycle and tent, and in the company of members of his family) he had col-

lected in many out-of-the-way places as well as in nearly all the famous British localities, always placing his captures in the Natural History Museum. When on the Continent he made a point of visiting institutions possessing important collections of Diptera in order that he might acquire first-hand knowledge of types which would be invaluable to him in his revisionary studies. He led expeditions on two occasions : the first in 1926 to Patagonia and South Chile; the second in 1934-35 to the Ruwenzori Range, Uganda. He was a Quaker, adhering firmly to his beliefs in the Great War, 1914-18. Our heartfelt sympathy goes out to his wife and three daughters who survive him.

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EDITED BY

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JOURNAL OF THE SOCIETY
FOR BRITISH ENTOMOLOGY

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ECOLOGICAL AND BIOLOGICAL NOTES ON *BOREUS HYEMALIS* (L.) (Mecopt., Boreidae).

By LT.-COL. F. C. FRASER, I.M.S. (Retd.), F.R.E.S.

I am indebted to Mr. D. E. Kimmins for letting me have particulars of the locality on Hayes Common, Kent, where he found larvae of *Boreus hyemalis* (L.) on the 19th October, 1928. This Common and its continuation as Keston is well known to me, so that I was able to recognise the locality at once and to proceed direct there on the afternoon of 26th September, 1941. Mr. Kimmins, when writing to me, had expressed the opinion that it would be too early for the imago but that I might find the larvae by breaking up moss. In previous years I had always sought for this insect by teasing out moss of the more luxuriant kinds, but 'breaking up moss' suggested digging up masses and looking for the larvae in the deeper parts or even in the soil beneath. Previous writers have always insisted that these are to be found 'in' moss, and the only reference I can find of the larvae being found beneath it is that of Dr. Blair in Scotland. It seemed to me that this might supply the clue to my failures in former years, and I therefore decided to try Mr. Kimmins's method.

His locality is situated in a long grove of birch trees at the top of the road rising alongside of Coney Hill, and at a point where it meets the Prestons road. Conditions were not propitious for my quest as the ground was bone-dry and moss very little in evidence. A full hour was spent in this copse during which every conceivable spot was examined : beneath oak and birch trees, alongside paths and beneath bracken, furze and bramble bushes : in fact everywhere that a growth of moss was observed. Thirteen years had passed since Mr. Kimmins discovered the species here, and it was now evident that the colony had petered out or that *Boreus* populations are of a floating nature. I had decided to give up the search and was in the act

of returning home when it occurred to me that if I could find some deep hollows on the common, conditions might be damper and the moss more in evidence. One such hollow was found about one hundred yards to the south : this was of the nature of a long and very broad trench some ten feet deep, bordered by high bracken and densely shaded by several large oak trees which trailed their half-exposed roots down the sides of the depression. A good carpet of fresh moss was found round the roots of these trees, and the ground beyond and above the depression showed an almost unbroken carpet of lush turf-like moss. I now turned my attention to the short velvety moss growing at the root of the oak trees, and with my penknife cut out a small sod of moss and broke it in two. To my great pleasure, a small, pearl-white object at once fell out, which on examination with a hand-lens proved to be the pupa of *hyemalis*. Thereafter pupae came fast and often : almost every sod in this spot yielded at least one of the insects. Along with them was found a small coleopterous-like larva which later was recognised as that of *hyemalis*. Whilst breaking up the sods of moss, I continually noticed the presence of tunnelling and channelling in the soil just beneath the roots of the moss, some of these being more than an inch in length. It was in the blind end of these tunnels where the pupae were invariably found, whilst the larvae fell from any part of the same as soon as the turf of moss was fractured. The pupal chamber is somewhat more spacious than the channels with which it is continuous, and is situated slightly obliquely with its blind end just below the roots of the moss. During my search, especially in the first locality where pupae were found, I continually came across yellowish oval cocoons occupying the pupal chambers but foolishly did not associate these with possible parasites of *Boreus* until later, when only two more were found. These last were kept, and from one of them, two days later, emerged a Braconid, diagnosed as *Dyscoletes lancifer* Hal., by Dr. F. Haines.

On Hayes Common, at least, a short, velvety, firm growth of *Polytrichum commune* is the sole habitat of *B. hyemalis*. Three types of growth were found and carefully searched for the presence of larvae, but it was only in the short firm growth, with a direct foundation of friable sandy loam, that any were found. The other two types were firstly, a lush growth implanted on the débris of many former years' growth, and secondly, a shorter growth than the first implanted on a felt-like base of leaf and fine roots. The larva of *hyemalis* is so helpless a creature, and with claws not adapted for digging, that it would find the greatest difficulty in burrowing a channel through such a medium, whereas a crumbling soil would erect no such obstacles to its passage. Thus I feel convinced that it is the surface soil immediately below moss which forms the normal habitat of the

larva. Where moss is of great depth or is growing on a felt-like base of leaf-mould, owing to the great amount of air contained in its interstices, it will give forth a resonant or drumlike note on percussion with the knuckles. This fact is of considerable help in looking for larvae, as the habitat of *hyemalis,* resting as it does on a solid base of soil, gives forth a dull or flat note. Employing this test on a large number of occasions on the 28th and 29th September, I was never once at fault, whereas control explorations on other and resonant sites were one hundred per cent. negative. After securing fifty pupae and a number of larvae, I spent the rest of my time on Hayes Common determining the extent of its habitats both locally and far afield. Locally, colonies of larvae and pupae were found to extend no further than one and a half feet from the trunks of oak or birch trees, unless roots ran out from these. In the latter case, pupae were found alongside the roots in the growth of moss bevelling off the angle between the roots and the ground-level. The reason for this association with tree trunks was not clear, but was probably directly associated with the moss which is more prevalent in such sites. The distribution over Hayes Common is far and wide: I spent some time on the 29th trying to determine this and found the insect from one end to the other wherever suitable habitats occurred. Sometimes only one would be found; at other times, as many as a dozen would be turned up in the space of less than one square foot.

The spoil collected on the above three dates was taken home to Bournemouth and there put into an aquarium containing an inch of loam turfed over with a short firm growth of *P. commune* moss. Larvae were very sluggish but the pupae most active, wriggling and rolling over from side to side. Holes were drilled with a pencil in the moss, and a pupa dropped into each. The aquarium was then placed out in the garden in a well-sheltered and shady spot.

The first imagines emerged on the 15th October, a male and a female then being observed for the first time running about on the surface of the moss. These were fully coloured and decidedly metallic, so that they may have emerged some days previously, especially as later observations showed that the newly emerged insect is uniformly cream-yellow and that at least five to seven days are taken for full colouring to be assumed. Thus we may say with some surety that emergence of these specimens took place about the 10th October. The females were very sluggish, the males correspondingly very active; the former did not appear to feed at all prior to mating, whereas the males fed voraciously from the first emergence. For better observation, several were put into large test-tubes which had been half-filled with soil and then a cork of moss pushed down snugly on top of this. The mouth of the tube was then plugged with cotton-

wool. The insects evinced no alarm when the tubes were handled or placed under the microscope for closer observation : they continued to run about and feed most unconcernedly. The function of feeding is most interesting : the insect walks about thrusting its rostrum into the interstices of the moss or bracts and bases of the leaves, reminding one of the action of a stork or crane probing for fish : finally it comes on a clump of young shoots of moss and then proceeds to eat the top off one of these. The apex rapidly nibbled off, it continues to eat downwards into the core of the shoot until nothing is left but a conical shell of the foliage, in which the rostrum is buried up to the eyes. By holding the test-tubes at eye level, this process was watched again and again, and owing to the transparency of the thinned-out shoot, the rostrum and jaws could be seen with great clarity buried in its heart. As one shoot was finished, the insect passed on to the next until quite a small area had been browsed over. There is no doubt that the diet of *hyemalis* is purely vegetarian and consists of the young tender shoots of moss and possibly also the bases of leaves of the same. After mating, which occurred in the second week from emergence, the females evinced the same voracious hunger and appeared to be continually feeding. It was observed that the male continued to feed even when copulated with the female, which it carried aloft as if riding on its back. The latter lay passive with her rostrum tucked between the wings of the male.

Night and early morning observations were made and showed that the insect is largely crepuscular, the whole population of the aquarium being on the move at such times, whereas only one or two would be seen walking about during the day. In spite of this, sunlight did not appear to worry them and, at such times, it was only after disturbance that they took to cover, when they would disappear rapidly into holes and chinks in the mossy carpet.

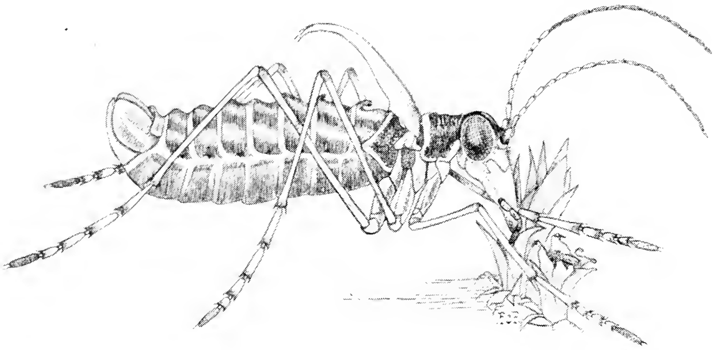
McLachlan, in his Monograph of the British Neuroptera, states that males are rarest; in my series, females worked out at 42 per cent. only, so that they are actually more scarce than the males. It is quite easy to distinguish the sexes even in the pupal stage, and, when securing the pupae in the first place, I was struck by the great preponderance of the male sex.

Some discrepancies may be pointed out here in Withycombe's figures of the male and female imago : the wings of the male are invariably held in closest apposition, so that they resemble a robust dorsal spine rather than the bunch of plumes depicted by Withycombe; the maxillary palps are shown sprouting from a common base in front and near the apex of the rostrum, this of course being quite incorrect. The palps are five-jointed as in *Panorpa* : a basal one, which is short but quite distinct, has not been mentioned by previous authors, and is followed by three

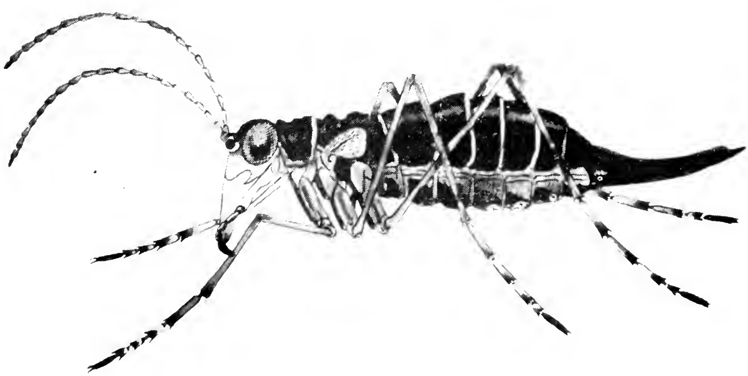
PLATE VI.

Pupa of *Boreus hyemalis* (L.) in its pupal chamber.

PLATE VII.



Male of *Boreus hyemalis* (L.) feeding on moss.



Female of *Boreus hyemalis* (L.).

longer and equal ones which are inclined at first forward and then backward to end in the longer, oval apical segment, which latter conceals and overlaps the end of the rostrum, thus giving a false but strongly marked appearance of a parrot-like beak to the latter. The dorsal plate on segment 2 is repeated in a smaller form on segment 3, but is variable in size, being sometimes as large as the anterior plate, sometimes almost obsolete. These lobes possibly function during the act of copulation but certainly not after this is effected, as daylight can be seen between the two sexes except where the sexual organs are connected. Only on one occasion was a female seen to be carried obliquely over the back of the male; in all other cases observed the female lay parallel with the male, held by the genital organs and supported in the fork formed by the slightly separated wings of the male. Her attitude then is characteristic: the head is fully flexed beneath the body, the rostrum in close contact with the coxae and thrust between the partially separated wings of the male. The middle and hind pairs of legs are strongly flexed and held bunched together closely apposed to the sides of her thorax, whilst the anterior pair project at right angles, and the tibiae, crossing one another, are passed under the wings of the male; it is as if she had folded her arms to embrace and hug to her breast the enclosed wings. This grip is further strengthened by the imbricated spines lining the lower borders of the wings.

Some measurements were taken of the jumping powers of these insects, but in no case did a leap exceed two inches, that is, considerably less than the six inches mentioned by some authors.

When first emerging the imagines are uniformly coloured creamy-yellow, and it is not until five or seven days are passed that the full colour is developed. Some females continue to darken in colour even after this period, so that too much importance must not be placed on this character for differentiating *B. hyemalis* from *B. westwoodi*. The colour differences mentioned by Hagen appear to me to be the result of mere age states. Regarding the shape of the ventral plate, it must be remembered that this is a curved structure, so that when viewed from certain angles the sides appear to be concave. The apex in all the Hayes specimens was obtusely pointed rather than truncate. I think that further proof is needed before it can be said definitely that two distinct species exist, especially as Hagen indicated that the British form was *B. westwoodi*! Up to the present, all British specimens have been diagnosed as *B. hyemalis* L.

To-day, the 16th November, imagines which emerged on the 10th of October are still alive, very active and feeding continually. Pairing has been promiscuous and frequent, but no females have been observed ovipositing although they are distended with ova. The colouring now is much darker and even the yellow legs are clouded with fuscous. Observations will be continued.

A FURTHER NOTE ON *ISCHNURA PUMILIO* (Charp.) (Order Odonata).

By Lt.-Col. F. C. Fraser, I.M.S. (Retd.), F.R.E.S.

Since my paper on *Ischnura pumilio* (Charp.) appeared in the last number of this Journal (Fraser, 1941, *J. Soc. Brit. Ent.,* **2**: 110), I have received a number of letters on the subject which throw more light on the distribution of the species. Two of these are from Mr. Attlee, who is disposed to resent the doubt which I expressed as to the correct identification of his Surrey specimens and therefore on the locality, which he now discloses is, or rather was, Richmond Park.

Mr. Attlee's letters are of some length and contain remarks on the differentiation of the two species *I. elegans* and *I. pumilio* which are largely repetitions of those contained in my paper, which he has seen, so that I will reserve myself to those passages which relate purely to the Richmond Park and New Forest habitats. The following are excepts from his letters :—

'I have 4 males, 1 typical female (? andromorph) and 1 var. *aurantiaca* (heteromorph) taken in Richmond Park, where I constantly saw quite a number (together with *elegans, cyathigerum, puella* and *nymphula*) during May 26—June 23 (1931), and May 20—June 15 (1932). I cannot give at all definitely dates as to its disappearance, but I know that I looked for it in vain in the earlier part of July in both years. My insects are of course very welcome to be inspected by anyone, but in these days I can neither send nor take one about. I gave one to Mr. C. O. Hammond and possibly (?) to Mr. F. J. Killington.'

'I subsequently (June 17) saw one in New Forest, and in (? /34 or /35) found several there and two 2 dead males (in a tiny runnel), which agree with those in Richmond Park.'

'I kept the locality secret as it would have been easy for any "series collector" to nearly or quite exterminate it. I found the pond almost drained in autumn or winter /32. Pond was filled months later but a *runnel feeding it* was put underground (either then or ? before) and that, I now think, was the cause of its disappearance (? pumilio's). (A hut is now built (I believe) on the sphagnum bog which was no doubt its chief haunt.) Though the pond seemed unlikely in being so high (at the time), may that not be an argument in its favour, for tenerals "blown out of their course." More to the point—the head quarters of *pumilio* (where it probably bred) was the real bog of sphagnum—roughly 30-40 yards by 20—thoroughly saturated by a tiny runnel which ran between rushes etc. for perhaps 50-70 yards from the top of the Park near Kingston Hill wicket gate. This

runnel being turned into an underground pipe (? same time as pond was drained) caused the disappearance of my *pumilio*, and, for a season or two, of the *elegans, puella, cyathigerum* and *nymphula*.'

'Dr. Fraser's inclination to suspect "incorrectness" on no foundation whatever, is beyond my comprehension; had he known the *locality* and queried it as a *natural* haunt, I could have understood *that*.'

After receiving Mr. Attlee's letters, I wrote to both Dr. Killington and Mr. Hammond: the former replied that he had never received a specimen of *pumilio*, and the latter never acknowledged my letter. It will thus be seen that Mr. Attlee's record rests on a locality which he himself acknowledges as *unnatural* and which he says has since disappeared and so is no longer available for checking. Regarding the actual specimens, he never submitted any to experts for confirmation of his identifications. These specimens, he says, are now alongside genuine New Forest ones but are apparently unlabelled, since he states that the one he sent to Mr. Hammond bore no label or data, and another, which he has shown to Dr. Hobby quite recently, also was without a label or data. Science is a very exacting mistress and demands clear-cut proofs from her votaries, and elementary law demands the production of witnesses. In the case of my New Forest locality and specimens, although a specialist myself in the order Odonata, I sent a small series to the late Mr. Morton for confirmation, and also took Dr. F. Haines to my locality where he himself was able to verify them by actual captures. In a letter from Mr. Lucas to Mr. R. McLachlan which lies before me, dated 1st February, 1897, I read the following: 'Have you not mis-read my note with regard to *Ischnura*? I have never been fortunate enough to meet with a locality for *I. pumilio* and should be glad to hear of one.' How happy would he have been to be informed of a locality which was practically on his front door-step! And how fully would Mr. Attlee's Richmond Park locality have been confirmed if he had taken Mr. Lucas into his confidence and taken him to the spot!

Another letter in regard to the distribution of *I. pumilio* in the New Forest comes from Dr. K. G. Blair, and runs as follows: 'You may be interested in my very limited experience of the insect. This was on 29th June, 1904, in a swamp "near Hinchelsea House." This swamp was very wet, so that I took off my shoes and stockings to go after them. The insect was not uncommon and I took some half-dozen pairs, but have now only 1 male and 2 females left. It was in company with *P. tenellum*, which so far as I remember was more plentiful. The only *A. mercuriale* I ever took was in June '05 on the "upper Oberwater," I think near Rhinefield Enclosure. This spot for *pumilio* seems different from those you note.'

Actually this new locality lies well within the area occupied by *pumilio* in the New Forest, which may be said to be the greater part of the length of the Oberwater valley and Rhinefield. My locality would lie about 3 miles west of this, whilst Mr. Attlee's would be 1½ miles north-east of it. A fourth locality, near Brockenhurst, lies about one mile due east of Hinchelsea House, and there are probably more colonies not yet identified within the same area.

Mr. Attlee calls my attention to a variety of *pumilio* which I have failed to mention in my paper, but this rather falls outside the scope of the article. This variety, which Mr. Attlee is the first to call attention to, has the twin dorsal spots on segment 9 much enlarged. Many stages of this enlargement are to be seen, varying from a simple enlargement of the spots up to a small triangular spot with a linear extension basalwards which occasionally becomes confluent with a narrow basal black ring. Similar spots are sometimes found on segment 8 in *I. elegans*.

A NOTE ON THE HIBERNATION OF *TRIPLAX AENEA* Schall (Col.).

By Lt.-Col. F. C. Fraser, I.M.S. (Retd.), F.R.E.S.

Whilst prospecting for hibernating larvae and pupae of Neuroptera in the New Forest on 1.i.42, I was fortunate enough to come on a colony of hibernating *Triplax aenea* Schall. The site was an old decayed stump of a holly tree standing quite isolated in the bracken and heath except for a similar stump some ten feet from it. So far as I could see the two stumps were identical: neither showed any evidence of any fungus growing on it, both were equally decayed, although one, which harboured the beetles, had rather more loose bark clinging to it. The beetles were found beneath the bark from ground level to as high as I could reach, and were also deep in the wood itself, many being found in old galleries either made by themselves or by some other Coleoptera. In many places, three, four or more of the beetles were found assembled together. I secured 125 from this one trunk and could have obtained many more had I persisted in my operations, yet in the neighbouring stump, only ten feet away, not a single specimen could be found after the most thorough questing. I then tried more hollies in the neighbourhood, their nearest being some sixty yards away. This latter had considerable fungus beneath its loose bark and otherwise resembled the first stump closely, but here again I drew blank. A number of other stumps were investigated, but I finally had to give up the search. The search was renewed on the 8th March,

and although 100 out of the 125 quoted were obtained at this date, not a single specimen could be found in any of the other dead hollies round about. What can be the explanation of this remarkable isolation? Fowler gives the species as rare, and this is corroborated by Dr. Haines, who, living quite close to this locality for the past twenty years, has failed to find the species, although he is an ardent coleopterist. It would seem that the species is not so much rare as 'extremely local.' Possibly the females are very lethargic and, once established in a stump, go on breeding and interbreeding until a large colony results. I can think of no other explanation. The food is said to be a fungus, but if so it must be of a microscopical size, for a careful search did not reveal the presence of any macroscopical one.

A NOTE ON THE 1941 IMMIGRATION OF *SYMPETRUM FONSCOLOMBII* (Selys) (Odon.).

By Lt.-Col. F. C. Fraser, I.M.S. (Retd.), F.R.E.S.

The present year (1941) has witnessed the greatest immigation of the dragonfly *Sympetrum fonscolombii* (Selys) since the years 1911-1914. Reports have reached me from as far west as Somerset and as far north as the Isle of Man, whilst in many parts of the south of England they have been seen in great numbers. In Bournemouth I first observed the species in considerable numbers during the last week in June, when they were flying over the flooded lawns of the Lower Gardens or settling on the gravelled paths. On the 9th July it was in considerable numbers over the Coy Pond in the Upper Gardens, both sexes being represented, and I took nine males and a single female in a short space of time. Specimens were seen over this pond up to the end of the first week in August, when *Sympetrum striolatum* appeared to have entirely replaced it. Many females were seen ovipositing in the late afternoon during the August week, so that, if the species breeds in this country, it ought not to be difficult to obtain the larva later on. It is doubtful, however, whether *fonscolombii* does establish itself here, even for a few years following on an immigration, for no larvae or exuviae have ever been found. Dr. Haines, observing it in numbers over the ponds on Morden Heath, Dorset, and observing that they appeared to be teneral, formed the conclusion that the species had bred there. Others, noticing this teneral condition, have come to the same conclusions. Surely, if this is the case, exuviae ought to have been obtained in abundance? That exuviae have not been found seems to me clear proof that the imagines, in spite of their teneral condition, did not emerge there.

A second argument has been made much of, viz., that after any immigation the species turns up in the following years in steadily decreasing numbers and finally disappears altogether. It is as if the species has established itself temporarily, but owing to the unsuitable climate or other unknown factors, gradually dies out. Admittedly this reasoning seems very plausible, but it still lacks solid proof by way of the discovery of larvae and exuviae. The bald fact continues to be stated with regularity by most authors in spite of all absence of proof. Thus Miss Longfield* : '. . . occasionally breeding for as many as three or four years running '; and again, '. . . bred regularly until 1915.' In 1914 Dr. Haines observed it in great numbers at Morden, but in the following year, 1915, it had completely disappeared ! Why this sudden disappearance? Surely there ought to have been some progeny from such a swarm? To explain these immigrations and the period of successive years over which they last, it is necessary to study the conditions under which the species lives prior to the immigration, or rather 'exodus.'

In the tropics, emigration among certain species of Odonata is an annual event, so that with thirty years' residence in those climes I have had ample opportunities to study the phenomenon. In any given watery habitat there is usually a well-balanced distribution of life prior to the onset of the monsoons, but this is rapidly upset as the individuals constituting the populations grow in size and so require more food and space. At such times, if any small watery habitat be examined, it will be found that larvae are literally teeming under every patch of weed or cover of any sort, and if you take the trouble to copy the conditions in a small aquarium, you will find that cannibalism is rife and that a fierce struggle for existence is being waged in which every individual is his immediate neighbour's enemy. Towards the end of the pre-monsoon period, water is drying up and the populations therein are being further congested. In the fierce struggle engendered by overcrowding, two things are impressed on the instincts of the creatures—fear of their neighbours and hunger. The desire to escape from such a hell must increase up to the time of emergence, and, after that event, fear and hunger are the forces leading them to scatter far and wide. The normal instinct teaches the dragonfly to return in due course to its original larval habitat, there to deposit its ova, but in the face of the conditions described, normal instincts are overridden by those of fear. In the tropics life goes on more rapidly, and many species attain maturity within the space of a few months. When the rice fields are being flooded preparatory to sowing the crops, Odonata will be observed busily ovipositing : when these same fields are being drained four months later, preparatory to reaping the crops, the resulting imagines will be observed emerging

* Longfield, 1937, 'The Dragonflies of the British Isles': 135.

in scores. This speeding up of life means a speeding up of generations and thus a more frequent occurrence of congestion of populations than is the case in more temperate regions, where conditions comparable with those of the tropics are only reached after long periods of twenty or thirty years. Drought, which as we have seen in the case of the tropics plays a secondary part by increasing the congestion of populations, probably rarely acts in temperate areas, but we do know that periods of drought occur every few decades, so that it may come into play at times. Any habitat which is nearing saturation point, would find that point precipitated by the occurrence of a drought.

A study of immigration records will show that small invasions frequently occur in the year previous to a major immigation, and this is quite understandable if the habitat is reaching saturation point : it may be likened to a kettle boiling over. Similarly, small immigrations will be noticed for a year or two after a major one, indicating that the population of some habitat has not yet been sufficiently lowered as to attain a normal balance of the distribution of life. So long as there is fear and hunger engendered in the masses by overcrowding, so long will the exodus from any particular colony go on. Such are the factors which I believe are behind the immigrations of *fonscolombii* into this country : they explain the minor preliminary and subsequent immigrations, and they explain the absence of larvae and exuviae in and around our ponds along with a teneral condition of the individuals comprising the immigration. There is no time to tarry and feed up preparatory to flight : to do so would be to court death from starvation : they must scatter immediately to obtain food. Thus *flights take place only in the teneral stage.* In Bournemouth, every year, during the second week in August, there is an immigration of *Aeshna mixta* : scores may be seen at times, but every one in the pack is a teneral. *Gomphus vulgatissimus* in the New Forest emerges en masse in a period of one or two days. I have been fortunate to witness this emergence on two occasions, when I found the banks of the stream literally alive with crawling larvae and emerging imagines. So soon as their wings were strong and dry enough to bear them, they took flight directly away from the stream in the direction of the pine forest. Thereafter any collector visiting the stream for the next week or ten days would have sought in vain for the insect, although plenty of exuviae would proclaim that they had been there recently. After that time, imagines begin gradually to appear and are now no longer teneral, although many may be said to be in a subadult state. Here then you find adults *plus* exuviae together, contrasting strongly with the conditions prevailing in the case of *fonscolombii* where tenerals and subadults are found *minus* exuviae, proving that they have not originated from these particular habitats. The late Mr. Lucas found exuviae

of *G. vulgatissimus* long before he ever succeeded in taking the imago, but he was never able to explain the absence of the latter. In a normal emergence, the imagines make for the nearest cover, feed up and attain maturity, and finally return to their birthplace to oviposit and pair : in a mass emergence, precipitated by an excessive population, the imagines leave their habitat to return no more. I doubt if we shall ever find exuviae of *S. fonscolombii* in this country although young larvae may be found.

A LIST OF THE TRICHOPTERA (CADDIS-FLIES) OF THE LAKE DISTRICT WITH DISTRIBUTIONAL AND SEASONAL DATA.

By D. E. Kimmins.

This paper is the outcome of a season's collecting in the southern part of the English Lake District, much of the work being done in the neighbourhood of Wray Castle, Windermere. More distant localities were visited whenever occasion offered, but difficulties of transport were a considerable handicap. Other orders of aquatic insects, such as Ephemeroptera and Plecoptera, were also collected, but special attention was paid to the Caddis-flies, since in this group the fauna of the district is comparatively much less known. Short lists, the results of holiday collecting, have been published from time to time, but I do not know of any paper dealing as a whole with the Trichopterous fauna of the Lake District. For the purpose of this paper I have followed Macan (1940) in restricting the term 'Lake District' to those parts of Cumberland, Westmorland and North Lancashire forming the central region of hard, non-calcareous rocks.

It is not suggested that the present list is complete : additions are certain to be made, particularly in the smaller forms, such as the Hydroptilidae, but it is hoped that it may serve as a basis for future work, particularly on the earlier stages of the Trichoptera. As a result of one season's collecting (commencing in April 1941), ninety-one species of Trichoptera were taken. Examination of the British Museum collections increased the Lake District list to ninety-six species, and with the addition of seven records from literature we have a total of one hundred and three species, more than half the number recorded from the British Isles. One species (*Cyrnus insolutus* McL.) is a new record for the British fauna, and two others had not previously been recorded from Great Britain, although they occur in Ireland. Subsequent collecting in 1942 has added three more names to the list. All dates given refer to 1941 unless otherwise stated.

Many of the specimens were obtained by beating the branches

of trees near water, and it was noticed that all trees were not equally favoured by Trichoptera as shelter. In the spring and early summer, conifers such as juniper and larch were very productive, but as the season progressed broader-leaved trees, oaks in particular. were more favoured. Alders as a rule were not productive. It is hard to believe that insects which have no real association with trees should have acquired such a degree of selectivity in their choice of shelter, and it is more probable that it is a purely mechanical result due to the insects being dislodged by wind from unsuitable cover.

Some attention was paid to the higher becks (1,500 to 2,000 feet), where ten species of Trichoptera were obtained, all but one of which were also taken at lower levels. A number of these species normally frequent streams in wooded areas, or which are at least shaded, and it is interesting that these shade-loving species should also be able to exist in the exposed streams above the tree-line. What factor or factors govern such a distribution I do not know, but it is possible that the higher becks, being spring fed, maintain a lower and more equable temperature, and are less likely to dry up during periods of summer drought than a stream of similar size in an exposed position at lower levels. In one instance at least, the stream at Rydal Head on the slopes of Fairfield was still running at the end of the summer's drought, when many of the small becks flowing into Windermere were dry. In the absence of trees on the hillside, the adults are usually found sheltering beneath stones. Certain species tend to be smaller from stations above 1,500 ft., but this reduction in size is by no means constant, nor is there such pronounced brachyptery as one finds in some species of Plecoptera at similar altitudes.

My thanks are due to the trustees of the Godman Fund for a grant to enable me to make collections of Lake District aquatic insects for the British Museum; to Dr. E. B. Worthington, Director of the Freshwater Biological Association's Laboratory at Wray Castle, where the work was carried out, and who made available to me MSS. faunistic lists of various aquatic groups; to my colleague Mr. W. E. China, who joined me on a number of my collecting trips and who collected extensively in several localities at Hawkshead and Hawkshead Hill; and to Miss W. E. Frost, in whose car I visited a number of more distant localities which it would have been very difficult to reach otherwise.

All localities in this list are in the vice-county of Westmorland and Lake Lancashire, unless otherwise stated. The locality 'Hawkshead Hill,' which was worked by Mr. W. E. China from mid-July to early October, is at an altitude of about 550 ft., and consists of two small becks, Tenter Beck and Thurs Beck. The first is a succession of small falls and rocky pools under hazel, alder and oak shade, and the other is more open, running through pasture-land, with marshy borders and a gritty bed.

On the Cunsey Beck three stations were worked, Ees Bridge, Eel House Bridge and near Cunsey Wood. The first station is immediately below the outlet from Esthwaite Water. The stream is of moderate depth and not very fast. Owing to the proximity of Esthwaite, there is a tendency for both lake and stream species to occur together in the adult stage. The second locality is a short stretch of rather deeper water with still pools fringed with alder, hazel and other trees. The third section is nearer to the mouth of the beck and is faster, with moss-covered boulders and approximates more to river conditions.

The order of classification adopted in this list is that followed by Mosely in his Handbook of British Caddis-flies, 1939.

Phryganeidae.

Neuronia ruficrus (Scopoli).

L. Windermere, Belle Grange, 130 ft., 16.vi.
Hawkshead, near Black Beck, 200 ft., 16,23.vi.
Claife Heights, Wray Mires Fishpond III, 600 ft., 4.vi.1942.
Brathay Quarries, 200 ft., 8.vi.1942.

Mosely says of this species that it is local and occurs in deep weedy pools, often at considerable altitudes. Of the three examples taken in 1941, that at Belle Grange was flying near the lake (4.30 p.m., G.M.T.). It is possible that it may have come down from one of the tarns on Claife Heights on a lumber waggon. This species is a strong flier, and several specimens were taken at least a quarter of a mile from Brathay Quarries.

Phryganea striata L.

Blelham Tarn, 17.vi.
Claife Heights, Scale Tarn, 18.vi.
,, ,, Wray Mires Tarn, 21.vi.
L. Windermere, mouth of Blelham Beck, 25.vi.
Rydal Water, 28.vi (G. Thompson).

The examples from Wray Mires Tarn were taken at about 9.15 p.m. G.M.T., the flight period having just begun.

Phryganea varia F.

Claife Heights, Wray Mires Fishpond II, III, 28.vii.
,, ,, Nor Moss, 27.vi.
Blelham Tarn, 4,13.vii, 18.viii.
Tarn Hows, 23.vii.
L. Windermere, Bee Bay, 27.vii.

This species was found most frequently on tree-trunks, where its colouring made it very inconspicuous. In common with a number of other Trichoptera, *P. varia* can produce a rather unpleasant scent, which is particularly noticeable if the insect is captured in an exhauster. On a hot calm day I could detect the scent when a specimen was flushed from a tree-trunk and flew

past my face. The ability to produce this smell is not confined to one sex.

Phryganea obsoleta McL.

Scandale Tarn, 1,800 ft., 3,20.ix.

Not common and rather difficult to collect, as most of the specimens were resting on the exposed stems of water plants at some distance from the shore. Mr. Hickin reports this species from Grisedale Tarn, near Dollywaggon Pike, 1,768 ft., 7.viii.1938.

LIMNOPHILIDAE.

Colpotaulius incisus (Curt.).

Blelham Fishpond Beck, 12.vi.
L. Windermere, mouth of Blelham Beck, 25.vi.

Two specimens taken on each occasion.

Glyphotaelius pellucidus (Retz.).

Blelham Tarn and Beck, 20,28.v, 12.vi, 4,13.vii, 18.viii, 11.ix.
L. Windermere, Wray Castle boathouse, 30.v.
,, mouth of Blelham Beck, 31.v.
,, Epley Head, 1,15.vii.
Tarn Hows, 23.vii.
Cunsey Beck, Ees Bridge, 2.viii.

Abundant in early summer and again in August in the vicinity of lakes.

Limnophilus rhombicus (L.).

Blelham Tarn and Fishpond, 12.vi, 4.vii.
Claife Heights, Scale Tarn, 18.vi.
L. Windermere, Watbarrow Point, 1.vii.
,, Epley Head, 4.vii.
Tarn Hows, 23.vii.

At Tarn Hows many examples were found dead under stones at the edge of the lake, attached to the stone by a fungus, which was probably saprophytic.

Limnophilus marmoratus Curt.

Claife Heights, Scale Tarn, 18.vi.
Blelham Tarn, 4,13.vii, 18.viii, 19.ix, 7.x.
Tarn Hows, 23.vii, 30.viii.
Cunsey Beck, Ees Bridge, 2.viii.

Abundant at Blelham and very variable in intensity of markings; specimens were sheltering in conifers more frequently than amongst the foliage of deciduous trees.

Limnophilus xanthodes McL.

Blelham Tarn and Fishpond, 20.v - 13.vii.

Abundant in this locality but not seen elsewhere in the district. Mosely records it as local but not uncommon in the Fens and Norfolk Broads. This species has a pronounced odour,

somewhat reminiscent of juniper, in which bushes it was frequently found.

Limnophilus lunatus Curt.

L. Windermere, Epley Head, 1.vii, 25,29.ix, 21,31.x, 12.xi.
,, Low Wray Bay, 23,30.viii, 4-15.ix.
,, Belle Grange, 8.ix.
Blelham Tarn, 18.viii, 11.ix, 7.x.
R. Brathay, Brathay Bridge, 2.ix.
Cunsey Beck, Ees Bridge, 14.ix.
Rydal Water, 2.x.

Abundant in autumn by lakes and rivers.

Limnophilus centralis Curt.

Blelham Fishpond Beck, 25,28.v, 12.vi, 4.vii, 20.viii.
L. Windermere, High Wray Bay, 22.vii.
,, Boathouse II Beck, 28.v.
Claife Heights, Scale Tarn, 18.vi.
Hawkshead, ditch near Black Beck, 23.vi.
Hawkshead Hill, Thurs Beck, 27.vii.

Seldom taken in any number, but not uncommon.

[*Limnophilus vittatus* (F.)]

Recorded from Lake District by Morton (1904, *Ent. mon. Mag.*, **40**: 53).

Limnophilus auricula Curt.

Blelham Tarn and Fishpond Beck, 25.v, 12.vi, 4,13.vii, 20.viii, 19.ix.
L. Windermere, High Wray Bay, 26.vii.

Found infrequently, single specimens being taken occasionally by beating.

Limnophilus extricatus McL.

Cunsey Beck, Ees Bridge, 2.viii.

Three examples beaten from a tree bordering the stream, which at this point is fairly slow. This locality is close to Esthwaite Water, in which the specimens may have bred.

Limnophilus luridus Curt.

Blelham Tarn, 29.v, 12.vi, 4.vii.
L. Windermere, mouth of Blelham Beck, 25.vi.
Claife Heights, Scale Tarn, 18.vi.
Hawkshead, ditch near Black Beck, 16,23.vi.

Moderately abundant in the neighbourhood of Blelham Tarn, together with *L. xanthodes*, but unlike that species, it was also found in other localities in the district. The period of maximum abundance was about the middle of June, about a fortnight later than the peak-period of *L. xanthodes*.

Limnophilus sparsus Curt.

Blelham Tarn, 27.v, 4,13.vii, 18.viii, 19.ix.

Hawkshead, ditch near Black Beck, 23.vi.
Cunsey Beck, Ees Bridge, 2.viii.
Hawkshead Hill, Tenter Beck, 14.viii.
L. Windermere, Bowness, 8.vii.

Fairly abundant, most frequently found in trees, especially conifers.

Anabolia nervosa (Curt.).
R. Brathay, Brathay Bridge, 2.ix.
,, Skelwith Force, 2.x.
Blelham Beck, 11.ix-7.x.
Cunsey Beck, Ees Bridge, 14.ix.
Esthwaite Water, 14.ix, 3.x.
L. Windermere, High Wray Bay, 25.ix.
Rydal Water, 2.x.
Loughrigg Tarn, 2.x.
Troutenbeck Head, Langdale, 1,700 ft., 4.x.

Abundant in many places, crawling over vegetation near the water and flying readily. Variable in size and intensity of colour. This species emits an unpleasant stale odour.

Asynarchus coenosus (Curt.).
Langdale, head of Meg's Gill, 12.ix.1942.

One male found dead on surface of a pool.

Stenophylax stellatus (Curt.).
L. Windermere, Epley Head, 1.vii, 25,29.ix.
,, Watbarrow Wood, 7,15.viii, 31.x.
,, Low Wray Bay, 4-15.ix.
Hawkshead Hill, Tenter Beck, 30,31.viii, 3,4,20.ix.
R. Brathay, Brathay Bridge, 2.ix.
Rydal Head, 2,000 ft., 3.viii (bred from pupa found by Miss K. Woolham).
Scandale Beck, 1,500 ft., 20.ix.
Troutbeck, 21.ix.

Abundant along the shore of Windermere, where it was obtained by beating branches of trees, particularly oaks. On the higher becks specimens were found hiding under stones. Specimens beaten from trees generally fall to the ground and feign death.

Stenophylax latipennis (Curt.).
Blelham Fishpond Beck, 19.viii, 19.ix.
Hawkshead Hill, Tenter Beck, 30.viii.
Cunsey Beck, Ees Bridge, 2.ix (taken at light, W. E. Frost).
L. Windermere, Low Wray Bay, 6.ix.

Less abundant than the preceding species, which it closely resembles, and I have only met with it singly. The males can be separated by the shape of the superior appendages.

Stenophylax permistus McL.
Blelham Beck, 11.ix.

One specimen only, a female, was taken along the slow-running section of Blelham Beck between the Tarn and Wray Road bridge.

Mesophylax impunctatus McL.
L. Windermere, Epley Head, 21.vi.
,, High Wray Bay, 16,25.ix.
,, Low Wray Bay, 15.ix.
Cunsey Beck, Ees Bridge, 30.viii.

About a dozen examples of this rather uncommon species were taken, usually singly, but on one occasion (16.ix) six were secured. All but one were taken by beating trees by the lake-side. The Cunsey Beck specimen (a female) was found crawling round a lamp in a hut by the stream. Morton (1904) records the species from Coniston, where three females were taken by beating and sweeping at night.

Micropterna sequax McL.
Hawkshead Hill, Tenter Beck, 4.viii.

One specimen, a male, beaten from bushes bordering the beck near its source.

Halesus radiatus (Curt.).
R. Brathay, Brathay Bridge, 2.ix.
L. Windermere, Low Wray Bay, 6.ix.
Blelham Fishpond Beck, 19.ix.
Troutbeck, 21.ix.

Less abundant than *S. stellatus* but occurring in similar habitats. The adults have a pronounced aromatic odour.

Halesus auricollis (Pict.).
Troutbeck, 21.ix.

Abundant on the only occasion upon which I found it, near Troutbeck Park. Numerous specimens were on the wing about mid-day (G.M.T.), especially in the lee of trees, the breeze being from the north. Later in the day, about 5 p.m. (G.M.T.), very few were seen, nor were they to be obtained by beating trees. The species is said to inhabit alpine regions, but this locality is only about 500 ft. above sea-level, and I saw no sign of the species further up Troutbeck.

Halesus guttatipennis McL.
Kilnshaw Chimney, above the Kirkstone Pass, 2,540ft., 20.ix.

Three females taken at the roots of grass around a peat pool close to the summit cairn.

Drusus annulatus Steph.
Coniston Old Man, Low Water, 1,800 ft., 29.vi.
Hawkshead, Black Beck, 29.vi.
Hawkshead Hill, 13.vii - 20.ix.

Torver Beck Head, 1,700 ft., 10.viii, 17.ix.
Rydal Head, 1,800 - 2,200 ft., 9.vii, 3.viii, 3.ix.
Scandale Beck, 1,500 ft., 20.ix.

Very abundant in some localities and subject to some variation in size. Examples from Rydal Head are decidedly smaller and paler (anterior wing 8-9 mm.).

Ecclisopteryx guttulata (Pict.).
Hawkshead, Black Beck, 30.v.

Mr. W. E. China reported this species in large numbers resting on grasses along a short stretch of the Black Beck in the early morning (7 a.m., G.M.T.), and making short flights when disturbed, after the manner of *Anabolia nervosa*. Later in the day none could be found, even by sweeping. The species is said to be very abundant in mountain regions, but this particular station is only about 200 ft. above sea-level. The only other occasion on which I have seen the species in this district was when an example was found on the running-board of a car on arrival at Ennerdale Water.

Chaetopteryx villosa (F.).
Blelham Beck, 11.ix, 7.x.
L. Windermere, Watbarrow Point, 31.x (♂ ♀ in cop.).

Taken by beating and sweeping vegetation.

Apatania wallengreni McL.
L. Windermere, shore near Wray Castle, 7.iv - 16.v.

Under stones on the shore, particularly near Wray Castle boathouse. (In mid-April, 1942, this species was seen in some numbers flying around trees close to the lake shore in sunny weather.)

Apatidea fimbriata (Pict.).
Rydal Head, 2,000 ft., 1.vi.

A dead pupa was found in which the genital structures could be sufficiently distinguished to identify the species.

[*Apatidea muliebris* (McL.)]

Morton (1925, *Ent. mon. Mag.*, **61**: 130-131) records the capture of this species near streams from pools on the lower slopes of Coniston Old Man, 18-20.iv.1925.

SERICOSTOMATIDAE.

Sericostoma personatum (Spence).
Blelham Fishpond Beck, 16.vi.
L. Windermere, Epley Head, 15,18.vii.
,, Low Wray Bay, 10.ix.
Cunsey Beck, near Cunsey Wood, 19.vii.

Taken by beating trees. Examples of both female varieties (*analis* Steph., *multiguttatum* Pict.) were found on Windermere.

Goëra pilosa (F.).

Cumb.: Ennerdale Water, 19.vi.
R. Leven, Backbarrow, 30.vi.
R. Brathay, Brathay Bridge, 14,18.vii, 2.viii.
Cunsey Beck, Ees Bridge, 2.viii.
L. Windermere, Epley Head, 1,15,18.vii, 25.ix.
,, Bowness, 8.vii.

Fairly abundant. In the living male, the dilated terminal segment of the maxillary palpus is bright saffron yellow.

Silo pallipes (F.).

Blelham Fishpond Beck, 29.v, 19.ix.
Hawkshead, Keen Ground Beck, 27.vi.
Hawkshead Hill, 13,27.vii, 23.viii.

Generally found amongst low herbage bordering small becks.

Silo nigricornis (Pict.).

R. Winster, near Bowland Bridge, 8.vi.

According to Mosely, this species frequents larger streams than the preceding one.

Crunoecia irrorata (Curt.).

L. Windermere, trickles on Epley Head shore, 18,22.vii.
Hawkshead Hill, Thurs Beck, 28.vii, 7.viii.
Blelham Fishpond Beck (seepage in small gorge), 20.viii.

Occurs sparsely in the neighbourhood of small trickles and springs.

Lepidostoma hirtum (F.).

L. Windermere, Bowness, 16.vi.
,, High Wray Bay, 17.vi - 14.viii.
,, Low Wray Bay, 23.viii, 6,10.ix.
R. Brathay, Brathay Bridge, 18.vii, 2.viii.
R. Crake, near Nibthwaite, 30.viii.
Cumberland: Ennerdale Water, 19.vi.

Taken freely sheltering in the foliage of trees along the stony shores of lakes, and along rivers.

Lepidostoma fimbriatum (Ed. Pict.).

L. Windermere, High Wray Bay, 14.viii, 21.x.
,, Low Wray Bay, 4,6,10.ix.
,, Belle Grange, 9.ix.

This species, which is new to the English list, has been previously recorded from Ireland, where it also occurs on lakes. The males are quite distinctive in the field, having a paler area in the centre of the anterior wing, leaving the base and apex dark. This pale area is due to the presence of creamy scales on the membrane of the wing and becomes less conspicuous after death. In *hirtum* the scales on the anterior wing are dark. There appears also to be a slight difference in the male genitalia. In *fimbriatum*

the basal upwardly directed branch of the inferior appendage is suddenly dilated before the apex, to which it gradually tapers; in *hirtum* the apex of this branch is only slightly clavate. The females are more difficult to separate, but I think that in *fimbriatum* the media in the posterior wing generally forks nearer the base than in *hirtum* (definitely basal of a line drawn from the base of the discoidal cell to the base of fork no. 5). The species appears to be later, and to have a shorter period, than *L. hirtum*.

BERAEIDAE.

Beraea pullata (Curt.).

Blelham Fishpond Beck, 16.vi.

One example was taken by the lower and more swampy part of the beck.

Beraea maurus (Curt.).

Hawkshead Hill, Tenter Beck, 29.vii, 4.viii.

Two specimens, taken on a small rocky beck.

Beraeodes minuta Etn.

Hawkshead, Black Beck, near Esthwaite Water, 12,20.vi.

In long grass, by sweeping: rare, or possibly discovered at the end of its season.

MOLANNIDAE.

Molanna angustata Curt.

L. Windermere, Belle Grange, 18.vi.
,, near mouth of Blelham Beck, 25.vi.
,, Bowness, 8.vii.
Hawkshead, Priest Pot, 23.vi.
,, Esthwaite Water, 28.vi.
Blelham Tarn, 4.vii.
Tarn Hows, 23.vii.

Fairly abundant by lakes.

ODONTOCERIDAE.

Odontocerum albicorne (Scop.).

Hawkshead Hill, 13,28.vii, 4,7,9.viii.
Tarn Hows, 23.vii.

Hickin records it from L. Windermere, Balla Wray and Claife Heights, Wise Een Tarn.

LEPTOCERIDAE.

Leptocerus nigronervosus (Retz.).

Loughrigg Tarn, 23.v.1942.
R. Brathay, above Skelwith, 23.v.1942.
L. Windermere, early June, 1942.

Specimens in the British Museum collection from Coniston Water, vi.1922.

[*Leptocerus fulvus* (Ramb.)]

Specimens in the McLachlan collection labelled 'Lake District, vii-viii.1900.' Morton (1904) records the species from Brothers Water.

Leptocerus alboguttatus Hag.

R. Brathay, Brathay Bridge, 18.vii.

Hickin records the species from Tarn Hows and Mill Ghyll, Langdale, and there is a specimen in the British Museum from Cumberland, Threlkeld, viii-ix.1935.

Leptocerus aterrimus Steph.

Hawkshead, Priest Pot, 23.vi.
,, Esthwaite Water, 24,28.vi.
Blelham Beck, 24.vi, 4,13,29.vii.
R. Brathay, Brathay Bridge, 18.vii.
Loughrigg Tarn, 2.x.
L. Windermere, Epley Head, 15,18.vii.
,, Low Wray Bay, 23.viii.
,, Bowness, 8.vii.

The brown variety (? var. *tineoides* Scop.) occurred at Priest Pot, Blelham Beck and Loughrigg Tarn.

Leptocerus cinereus Curt.

L. Windermere, Epley Head, 15-22.vii, 14.viii, 25.ix.
,, Belle Grange, 22.vii.
,, Low Wray Bay, 23.viii, 10.ix.
,, Bowness, 8.vii.
,, Low Wood, 9.ix.
Tarn Hows, 23.vii.
Cunsey Beck, Ees Bridge, 14.ix.
Blelham Tarn, 4.vii.

Very abundant, flying in swarms over the water.

Leptocerus albifrons (L.).

R. Brathay, Brathay Bridge, 18.vii, 2.viii.
Cunsey Beck, Ees Bridge, 2.viii.
R. Crake, Birk Row, 30.viii.

Not very abundant, generally taken either flying over the river or by beating trees.

Leptocerus interjectus McL.

Cunsey Beck, near Cunsey Wood, 19.vii.
,, ,, Eel House Bridge, 2.viii.

This species is readily distinguished in life from *L. albifrons* by the jet-black ground-colour of the anterior wings. This unfortunately rapidly fades to a dark brown, when it is very difficult to separate the two species. My examples were taken flying over a small river containing mossy boulders.

Leptocerus bilineatus (L.).

R. Brathay, Brathay Bridge, 2.viii.

One male specimen taken at the same time as *L. albifrons*. King (1882) records the species at Elter Water, viii.1881.

Leptocerus dissimilis Steph.

L. Windermere, High Wray Bay, 18,22,28.vii, 4.viii, 16.ix.
,, Low Wray Bay, 22.viii.
R. Brathay, Skelwith Force, 28.vii.1942.

Mystacides nigra (L.).

L. Windermere, Watbarrow Point, 28.vi.
Blelham Tarn, 4.vii.
R. Brathay, Brathay Bridge, 14.vii, 2.viii.

Not uncommon but distinctly less abundant than the succeeding species.

Mystacides azurea (L.).

Hawkshead, Priest Pot, 23.vi.
L. Windermere, mouth of Blelham Beck, 25.vi.
,, Epley Head, 15.vii, 25,29.ix, 15.x.
,, Low Wray Bay, 4,10.ix.
,, Belle Grange, 8.ix.
,, Bowness, 8.vii.
,, Low Wood, 9.ix.
R. Brathay, Brathay Bridge, 14,18.vii.
Cunsey Beck, Eel House Bridge, 19.vii.
,, Ees Bridge, 14.ix.
R. Crake, 30.viii.
Tarn Hows, 23.vii.
Claife Heights, Wise Een Tarn, 6.ix.
Knipe Tarn, 5.ix.
Stickle Tarn, Langdale, 1,500 ft., 23.viii.

A very abundant species, particularly on Windermere, where large swarms may be seen flying over the water in late summer, often following boats. The female variety *albicornis* also occurs fairly commonly, and I have records of it from the Brathay, Cunsey Beck, Tarn Hows, Stickle Tarn, Belle Grange and Low Wood.

Mystacides longicornis (L.).

Blelham Tarn, 4,13.vii.
Esthwaite Water, 8.vii.
Tarn Hows, 23.vii.
Cunsey Beck, Ees Bridge, 2.viii.
L. Windermere, Bowness Ferry landing, 8.vii.

Fairly abundant but having a much shorter flight period than *M. azurea*. It is a very handsome insect when fresh, but very difficult to preserve in good condition as the wings easily become denuded of hairs.

Triaenodes bicolor (Curt.).

Hawkshead, Priest Pot, 23.vi.
Esthwaite Water, 28.vi, 8.vii.
Blelham Tarn and Fishpond, 4,29.vii, 19.viii, 19.ix.
Tarn Hows, 23.vii.
Knipe Tarn, 5.ix.

Abundant in some localities; when at rest on plant stems it is difficult to detect unless there is a slight breeze, when the movement of the long, white-annulated antennae reveals its position. The larva of this species makes a long, slender, cylindrical case of vegetable matter, and with the aid of its long legs swims through the water easily.

Erotesis baltica McL.

Hawkshead, Priest Pot, 23.vi.
Blelham Tarn, 4,13.vii.

Rather local and not very abundant.

Oecetis ochracea (Curt.).

Blelham Tarn, 4,13.vii.
Esthwaite Water, 8.vii.
L. Windermere, Epley Head, 15,19.vii, 24.viii.
,, Bowness, 8.vii.

Moderately abundant.

Oecetis furva (Ramb.).

Esthwaite Water, 6.vii.
Blelham Tarn, 29-31.vii.
L. Windermere, High Wray Bay, 22.vii.

Abundant for a short period at Blelham. The female is distinctly larger and paler than the male. Rare at Elter Water (King, 1882).

Oecetis lacustris (Pict.).

Tarn Hows, 23.vii.
Blelham Tarn, 29.vii.
L. Windermere, High Wray Bay, 9.viii.

Moderately abundant at Tarn Hows but scarce elsewhere. King (1882) records it as common at Elter Water, viii.1881.

Oecetis testacea (Curt.).

Blelham Tarn, 4,13.vii.
L. Windermere, Epley Head, 15-25.vii, 14.viii.
,, Belle Grange, 22.vii.
,, Watbarrow Point, 21.x.
R. Crake, 30.viii.
Hawkshead Hill, Tenter Beck, 21.viii.

Not abundant; usually taken by beating trees, seldom seen on the wing.

Setodes argentipunctella McL.

L. Windermere, Epley Head, 18,22.vii.
,, Bee Bay, 27.vii.
,, Low Wray Bay, 23.viii, 10.ix.
,, Bowness, 8.viii.

R. Brathay, Brathay Bridge, 18.vii, 2.viii.

Abundant on the shores of Windermere, especially amongst the leaves of oak. Two females from R. Brathay, Brathay Bridge (from whence it is recorded by King, 1882), appear to belong to this species. Hickin records this species also from Three Dubs and Moss Eccles Tarns ,Claife Heights), Blelham Tarn and Tarn Hows. We have worked Blelham Tarn fairly thoroughly throughout the season but saw no signs of this species. Morton (1904) records it from Coniston.

HYDROPSYCHIDAE.

Hydropsyche angustipennis (Curt.).

Blelham Beck, 3,17.vi.1942.

Hydropsyche instabilis (Curt.).

Hawkshead, Black Beck, 29.vi.
Blelham Beck, 16.vi.1942.
R. Brathay, Skelwith, 28.vii.1942.
Rydal Beck, 10,19.vii.1942.
Specimens in British Museum from Coniston, vi.1922; Cumberland, Buttermere and Watendlath, viii.1935.

[*Hydropsyche guttata* Pict.]

Common in Langdale district (King, 1882).

Cheumatopsyche lepida (Pict.).

R. Crake, near Nibthwaite, 30.viii.

Fairly abundant; taken by beating trees overhanging the river R. Brathay (King, 1882).

Diplectrona felix McL.

Hawkshead, Keen Ground Beck, 11.vii.
Hawkshead Hill, Thurs Beck, 13,27.vii, 4.viii.
Rydal Head, 1,800 ft., 9.vii.
Cumberland: Borrowdale, viii.1935 (in B.M. collection).

Not uncommon. Usually frequenting becks with plenty of shade, but the Rydal Head station is treeless and exposed to the mid-day sun. In this locality the specimens were found under stones.

POLYCENTROPIDAE.

Neureclipsis bimaculata (L.).

Blelham Beck, 24.vi, 11.ix.
Cunsey Beck, Ees Bridge, 2.viii, 14.ix.
R. Crake, near outflow from Coniston Water, 30.viii.
R. Brathay, Skelwith Force, 2.x.

Very abundant amongst foliage of oaks at Cunsey Beck, where the latter flows out of Esthwaite Water. The female is considerably larger than the male and with less distinct markings.

Plectrocnemia conspersa (Curt.).
Hawkshead, near Black Beck, 23.vi.
R. Leven, Backbarrow, 30.vi.
Hawkshead Hill, Tenter and Thurs Becks, 15,29.vii, [4,15,27.viii.
Blelham Fishpond Beck, 19.viii.
Rydal Head, 1,800 ft., 9.vii, 6.viii.

Resting in crevices of tree trunks near streams during daylight, where they may be found by inspection or by tapping the branches and trunks with a net. Their makings afford good protection. The Rydal Head examples were found under stones bordering the stream.

Polycentropus flavomaculatus (Pict.).
L. Windermere, High Wray Bay, 17.vi, 15-22.vii.
,, Low Wray Bay, 23,30.vii.
,, Belle Grange, 22.vii.
,, Bee Bay, 27.vii.
R. Leven, Backbarrow, 30.vi.
R. Brathay, Brathay Bridge, 14,18.vii, 2.viii, 2.ix.
Blelham Beck, 29-31.vii, 18.viii, 11.ix.
Cunsey Beck, 2,30.viii.
Claife Heights, Nor Moss, 27.vi.
R. Winster, 8.vi.
R. Kent, Kentmere, 22.vi.
Cumberland: Ennerdale Water, 19.vi.

Very abundant near streams and on shores of lakes. Often running over rocks in sunlight; also beaten from trees.

Polycentropus multiguttatus (Curt.)
Tarn Hows, 23.vii.

Two examples found under stones on shore at south end of tarn.

Polycentropus kingi McL.
Cunsey Beck, Eel House Bridge, 19.vii, 2.viii.

A series taken from a short stretch of stream below Eel House Bridge, where there is a deepish pool shaded by trees. They differ from Mosely's description in having the apices of the intermediate appendages turned up and not down.

Holocentropus dubius (Ramb.).
Claife Heights, Scale Tarn, 18.vi.
,, Wray Mires Tarn, 21.vi.
,, Nor Moss, 27.vi.
L. Windermere, mouth of Blelham Beck, 25.vi.
Blelham Tarn, 4.vii.

Not common, generally occurring singly.

Holocentropus picicornis (Steph.).
Blelham Fishpond, 19.viii.

One male example taken on the retaining wall of the fishpond. The colour of the spots is noticeably more reddish-gold than in *Polycentropus* or *Cyrnus*.

Cyrnus trimaculatus (Curt.).
Claife Heights, Wray Mires Tarn, 21.vi.
Esthwaite Water, 28.vi.
Blelham Tarn, 13,29.vii, 18.viii, 19.ix.
L. Windermere, Epley Head, 15,18.vii.
,, Bee Bay, 27.vii.
,, Low Wray Bay, 23.viii, 10.ix.
R. Brathay, Brathay Bridge, 14.vii.
Knipe Tarn, 5.ix.

One of the commonest species around lakes and tarns, on rocks and amongst foliage.

Cyrnus flavidus McL.
Blelham Fishpond, 3.vi.
,, Tarn, 29.vii.
Esthwaite Water, 8.vii.
Tarn Hows, 23.vii.
Knipe Tarn, 5.ix.
L. Windermere, Low Wray Bay, 6.ix.

Generally rather scarce but occurring in some numbers under stones at the southern end of Tarn Hows. A pale unicolorous variety was also found in this locality.

Cyrnus insolutus McL.
Blelham Tarn, 29-31.vii.

This species, which is an addition to the British list, was not uncommon amongst the rocks and at the roots of grasses at water's edge. A short note (with figures) recording its capture has appeared in the 1942 *Entomologist,* **75**: 66-68.

PSYCHOMYIIDAE.

Tinodes waeneri (L.).
Blelham Tarn, 4,13.vii, 18.viii.
Cunsey Beck, Ees Bridge, 2.viii.
Blind Tarn, near Goat's Water, 1,800 ft., 17.ix.
R. Brathay, Brathay Bridge, 2.viii, 2.ix.
L. Windermere, Epley Head, 15,18.vii, 1.ix.
,, Low Wray Bay, 23.viii, 10.ix.
,, Belle Grange, 22.vii.
,, Bowness, 8.vii.
Cumberland: Ennerdale Water, 4.ix.1935 (in B.M. collection).

Very abundant on Windermere, especially among the foliage of oaks.

Lype phaeopa (Steph.).
Blelham Tarn, 30.vii, 18.viii, 11.ix.

Found amongst low herbage.

Psychomyia pusilla (F.).
R. Brathay, Skelwith, 28.vii.1942.

Specimens in British Museum collection from 'Lake District, vii-viii.1900.'

PHILOPOTAMIDAE.

Philopotamus montanus (Don.).
Hawkshead, Vicarage Beck, 7,10,16.iv.
Oxenfell Beck, 18.v.
Coniston Old Man, 1,800 ft., 29.vi.
Levers Water inflow, 29.vi.
Hawkshead Hill, Tenter Beck, 18,28.vii, 2,30.viii, 20.ix.
Torver Beck, Walna Scar Road, 10.viii, 17.ix.
Stock Ghyll, 7.v.
Scandale Beck, 1,800-2,000 ft., 30.v, 20.ix.
Rydal Head, 1,500-2,000 ft., 1.vi, 9.vii, 6.viii, 3.ix.
Kirkstone Pass, below Raven Crag, 1,800 ft., 6.vi, 20.ix.
Pike o'Blisco, 1,500 ft., 20.vii.
Troutbeck, 28.vii.

One of the earliest Trichoptera to appear in the district and usually abundant throughout the season. It frequents rapid streams, particularly near waterfalls, and extends up to at least 2,000 ft. It is variable in size and markings, the Rydal Head examples being smaller. The larvae inhabit silken tubes, open to the current at their anterior ends, which are attached to stones.

Wormaldia occipitalis (Pict.).
Hawkshead, Keen Ground Beck, 11.vii.
Hawkshead Hill, Tenter and Thurs Becks, 15,28,31.vii, 2,4,30.viii, 3.ix, 7.x.
Scandale Beck, 1,600 ft., 20.ix.
Troutenbeck Head, 2,000 ft., 4.x.
L. Windermere, Watbarrow Point, 21.x.

Not met with in large numbers, usually near small streams, wooded at low altitudes, exposed higher up.

Wormaldia subnigra McL.
Blelham Fishpond Beck, 19.ix.
Troutbeck, 21.ix.
R. Brathay, Skelwith Force, 2.x.

Less abundant than the preceding species, and according to this year's records appearing rather later and possibly preferring rather larger streams. I have not found the two species in the same locality.

Chimarrha marginata (L.).
Hawkshead, Keen Ground Beck, 27.vi.

Cunsey Beck, near Cunsey Wood, 19.vii.
R. Brathay, Brathay Bridge, 26.vi, 14,18.vii, 2.viii.

Not uncommon in rivers and streams where there are moss-covered boulders.

RHYACOPHILIDAE.

Rhyacophila dorsalis (Curt.).
Blelham Fishpond Beck, 16.v, 19.ix.
R. Leven, Backbarrow, 30.vi, 7.xi.
R. Brathay, Brathay Bridge, 18.vii, 2.viii, 2.ix.
R. Crake, 30.viii.
Hawkshead Hill, Tenter Beck, 21,30.viii.
R. Winster, 8.vi.
R. Kent, Kentmere, 22.vi.
Troutbeck, 21.ix.
Scandale Beck, 1,600 ft., 20.ix.
Rydal Water, 2.x.
R. Brathay, Skelwith Force, 2.x.

Widely distributed on becks and rivers.

Rhyacophila obliterata McL.
Hawkshead Hill, Tenter Beck, 30.viii, 4,20.ix, 7.x.
Scandale Beck, 1,600 ft., 20.ix.
Troutbeck, 21.ix.
Troutenbeck Head, 2,000 ft., 4.x.

More local than the preceding species ; abundant on Tenter Beck in the autumn, appearing when *dorsalis* is declining in numbers.

[*Rhyacophila munda* McL.]

Specimens in British Museum collection from Cumberland: Threlkeld, viii-ix.1935.

Glossosoma boltoni Curt.
Hawkshead, Black Beck, 16.vi.
R. Kent, Kentmere, 22.vi.

Generally found on smaller streams than the following species.

Glossosoma vernale (Pict.).
R. Leven, Blackbarrow, 16.v (W. E. Frost).
Patterdale, 2.v.1942.

Mystrophora intermedia Klap.
Coniston, Hoathwaite Beck, 1,5.v.1942.

Eleven specimens were taken. This species flies very close to the surface of the water and is difficult to see. The locality is that recorded by Morton (1925, *Ent. mon. Mag.*, **61**: 130-131).

Agapetus fuscipes Curt.
L. Windermere, High Wray Bay, 28.v, 18.vii.
,, mouth of Blelham Beck, 25.vi.
Hawkshead, Black Beck, 23.vi.
Hawkshead Hill, Thurs Beck, 13.vii.

Tarn Hows, 23.vii.
Torver Beck Head, 1,800 ft., 10.viii, 17.ix.
R. Winster, 8.vi.
Rydal Head, 1,800 ft., 9.vii, 6.viii, 3.ix.
Troutbeck, 28.vii.

Very abundant, varying in colour from brown to blackish.

Agapetus comatus (Pict.).
R. Leven, Backbarrow, 30.vi.
R. Brathay, Brathay Bridge, 14.vii.

A single specimen only from each locality.

Hydroptilidae.

Agraylea multipunctata Curt.
L. Windermere, High Wray Bay, 2.vi, 19.vii.
,, Low Wray Bay, 30.viii.
Esthwaite Water, 28.vi, 8.vii.
Cunsey Beck, Ees Bridge, 2.viii.

Abundant on rocks on north-western shore of Esthwaite Water, near the boat moorings.

Agraylea pallidula McL.
Esthwaite Water, 28.vi, 8.vii.

Abundant in the same locality as the preceding species, where it hides in cracks in the rocks near the water's edge.

[*Hydroptila sylvestris* Morton.]
Specimens in the British Museum from Ambleside, viii.1881.

Hydroptila femoralis (Etn.).
L. Windermere, High Wray Bay, 7.vi.
,, Low Wray Bay, 23.viii.
,, Bowness, 8.vii.
Hawkshead, Black Beck, 16.vi.
Cunsey Beck, Ees Bridge, 2.viii.
Cumberland: Ennerdale Water, 19.vi.

Abundant on the shores of Windermere and Ennerdale Water. In the latter station they were swarming over the stone wall bordering the lake, near the hotel.

Hydroptila pulchricornis (Etn.).
Esthwaite Water, 28.vi, 8.vii.

Moderately common at the north-western end of the lake, near the boat moorings.

Hydroptila forcipata Etn.
Rydal Beck, 10.vii.1942.

[*Hydroptila tigurina* Ris.]
Specimens in the British Museum from Ambleside, viii.1881.

[*Ithytrichia lamellaris* Etn.]

R. Brathay, viii.1881 (King, 1882).

Ithytrichia clavata Morton.

R. Leven, Backbarrow, 30.vi.

The capture of these two males constitutes the second recorded station for this species in the British Isles. The species was first taken in Britain by Master A. D. Grensted at Llanbedr, Merionethshire, in August 1939. The River Leven, which is the effluent of Windermere, is at Backbarrow a large fast stream, flowing in a rocky course, a habitat rather similar to that in which the first British example was taken. The present specimens, together with two which escaped, were found on a large rock under trees. At Mr. Mosely's suggeston, I am giving figures of *I. clavata*; for although Tjeder has published detailed figures, they are not easily accessible to British workers. In general pattern the genitalia resembles that of *I. lamellaris*. Both species have the basally directed hairs on the side-pieces and on the inferior appendages. The most noticeable difference is in the absence of the dark, parallel, dorsal appendages of the ninth abdominal tergite; the inferior appendages are rounded at the apices from the side, not obliquely truncate; and the lower penis cover is produced at its centre, but not bifid.

A single female *Ithytrichia*, taken on the R. Crake, 30.viii, must in the absence of the male remain unidentified. It is however worth recording the presence of this genus on the R. Crake.

[*Orthotrichia angustella* McL.]

R. Brathay, viii.1881 (King, 1882).

Oxyethira costalis (Curt.).

L. Windermere, Low Wray Bay, 10.vi.
,, High Wray Bay, 11.vi.
,, mouth of Blelham Beck, 25.vi.
Cunsey Beck, Ees Bridge, 2.viii.
Knipe Tarn, 5.ix.

Usually abundant. The specimens from Cunsey Beck may possibly have bred in Esthwaite Water, which is only about a hundred yards distant, the beck flowing from it. On Knipe Tarn, *O. costalis* was the only caddis present in any numbers.

Oxyethira frici Klap.

R. Brathay, Brathay Bridge, 2.viii, 2.ix.
Cunsey Beck, Ees Bridge, 2.viii.
R. Crake, 30.viii.

Not uncommon but rather local: usually beaten from bushes.

Oxyethira sagittifera Ris.

Blelham Fishpond, 2,4.vi, 19-20,viii.

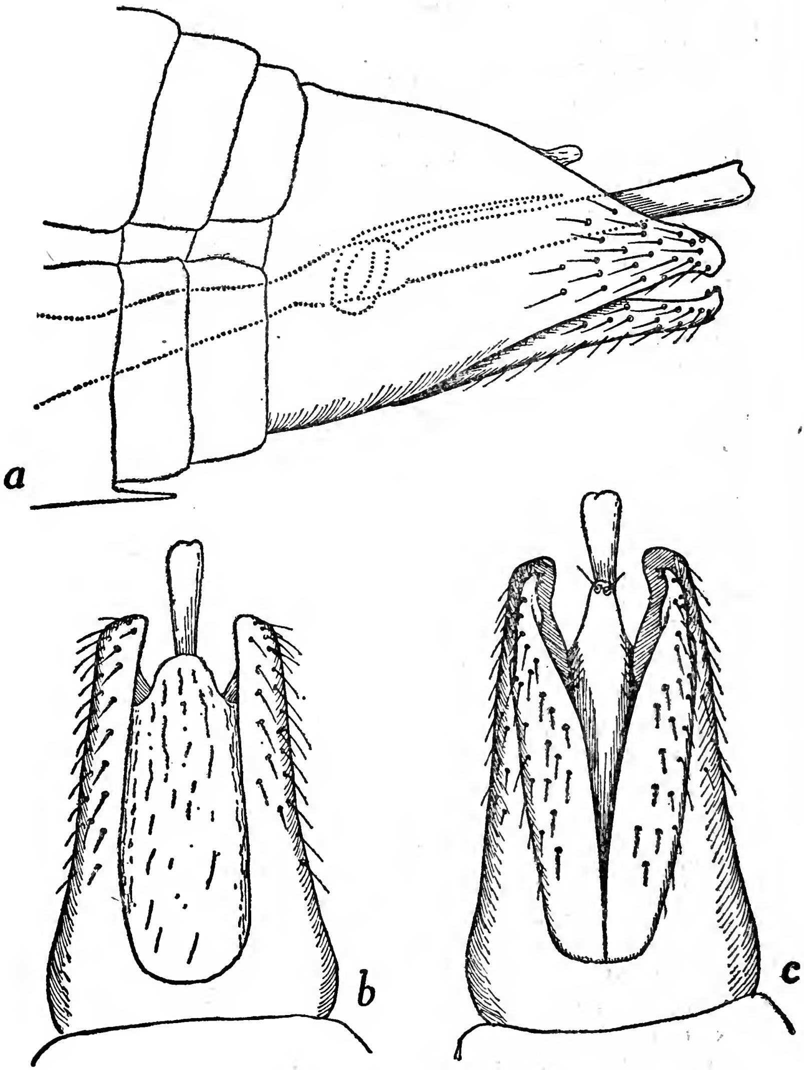


FIG. 16.—*Ithytrichia clavata* Mort., ♂ genitalia: a, lateral; b, dorsal: c, ventral.

Common on emergent vegetation and on the retaining wall of the fishpond. Possibly two-brooded, as examples were not found between June and August.

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SOME RECORDS OF LAKE DISTRICT PSOCOPTERA.

By D. E. KIMMINS
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Psocus gibbosus (Sulz).
Blelham, near Wray Castle, 19.viii.41. This species does not appear to have been recorded previously from the Lake District.

Psocus nebulosus Steph.
Claife Heights, Wray Mires, 30.vii.41 ; Brathay Bridge, 2.viii.41 ; Cunsey Beck, 2.viii.41 ; Blelham, 18.viii.41 ; Low Wray Bay, 10.ix.41 ; Troutbeck, 21.ix.41.

Loensia fasciata (F.).
Bred from nymphs taken under bark of sycamore in Stock Ghyll; High Wray Bay, tree trunks, vi.41.

Amphigerontia bifasciata (Latr.).
Brathay Bridge, 2.viii.41.

Amphigerontia contaminata (Steph.).
Blelham, 4.vii, 20.viii.41 ; Cunsey Beck, 19.vii.41. Not previously recorded from the Lake District.

Graphopsocus cruciatus (L.).
Whitbarrow Scar, 1.x.41 ; Loughrigg, 2.x.41.

Stenopsocus immaculatus (Steph.).
Brathay Bridge, 14.vii.41 ; Blelham, 11.ix.41 ; Low Wray Bay, 15.ix.41 ; Troutbeck, 21.ix.41 ; Whitbarrow Scar, 1.x.41 ; Loughrigg, 2.x.41.

Bertkauia lucifuga (Ramb.).
On August 30th, under stones on the shore of Windermere, by Wray Castle boathouse, I took a single female of this

species, which is an addition to the list of Lake District Psocoptera. *B. lucifuga* is probably more widely distributed than the meagre records would suggest. I have seen examples from N. Devon, N. Somerset and Berkshire, and it has also been recorded from W. Cornwall and W. Gloucestershire.

Caecilius flavidus (Steph.).
Low Wray Bay, 10.ix.41; Loughrigg, 2.x.41.

Caecilius burmeisteri Brauer.
Whitbarrow Scar, 1.x.41.

Peripsocus phaeopterus (Steph.).
Brathay Bridge, 2.viii.41.

Mesopsocus immunis (Steph.).
Hawkshead, 23.vi.41.

Elipsocus westwoodi McL.
Brathay Bridge, 2.viii.41.

Elipsocus hyalinus (Steph.).
Blelham, 27.v.41.

Philotarsus picicornis (F.).
Blelham, 19.viii.41; Whitbarrow Scar, 1.x.41.

Lepidilla kelloggi Rib.
On August 23rd, Mr. W. E. China found a single example of this scaly-winged Psocopteron under a stone on the shore of Windermere, near Wray Castle boathouse. A week later I took it in some numbers in the same situation, and the following week some more were seen and one example was beaten from a conifer. One was also beaten from trees near Loughrigg Tarn, 2.x.41.

In comparison with previous years' collecting in the South-east of England, Psocoptera do not appear to have been as abundant either in numbers of species or of individuals in the Lake District. They were admittedly not worked for intensively, but in the course of much beating and sweeping for Trichoptera, the results in the way of Psocoptera were distinctly poorer than I had expected. No doubt weather conditions had some effect, as the earlier part of the summer both this year and in 1940 was unusually dry.

AMPHINEMURA STANDFUSSI Ris (Plecopt.) IN THE LAKE DISTRICT.

By D. E. Kimmins
(Dept. of Entomology, British Museum, Nat. Hist.).

On August 3rd, 1941, while searching for adults of *Protonemura montana* Kim. at Rydal Head, I obtained a few examples of *Amphinemura standfussi* Ris, a Plecopteron not hitherto recorded for the Lake District. A second visit three days later

produced more specimens and also a few nymphs, whose identity was confirmed by breeding out in the laboratory. A few more adults were obtained on September 3rd, the last occasion on which I visited the locality this year. The specimens were found only near the source of Rydal Beck, under stones, at an altitude of 2,000-2,200 ft. They were decidedly smaller than lowland or continental examples and exhibited a definite brachypterous tendency. Lack of time and heavy rain prevented me from working the lower part of the stream at Rydal Head on the first two occasions where, about a month earlier, *A. cinerea* was common. This lower portion (1,500-1,800 ft.) was worked on September 3rd, but no examples of *A. standfussi* were found.

THE NYMPH OF *PROTONEMURA MONTANA* Kim. (Plecoptera).

By D. E. Kimmins
(Dept. of Entomology, British Museum, Nat. Hist.).

The specimens upon which this paper is based were obtained whilst the description of the adult was already set up in proof, and consequently it was not convenient to make further additions to that paper (the description of the female had already been added as an appendix).*

My thanks are due to Dr. Noel Hynes for allowing me to consult the manuscript of his work on the nymphs of British Plecoptera (since published by the Royal Entomological Society of London) and to make use of certain characters given there in comparing *P. montana* Kim. with the other British species.

The specimens were found under flat stones in a small stream, the source of Torver Beck, above Goat's Water, at about 1,700 ft., 17.ix.41. Four full-grown female nymphs and a number of nymphal exuviae were found, the latter on the underside of stones about an inch above the water-level. No other species of *Protonemura* was taken at this spot at the time, either nymphs or adults, and I have no doubt whatever of the identity of the nymphs, although it was not confirmed by breeding.

Description of Nymph of *Protonemura montana* Kim.

Size of full-grown nymph, 7·5-9 mm.

General colour rufous-brown, abdomen darker. Head wider than long, dorsal callosities scarcely darker than the rest of the head. Antennae a little longer than the thorax, yellowish-brown, slightly darker towards the tip, basal segment dark brown.

* See Kimmins, 1941.

Pronotum quadrate, broadest before the middle, posterior angles more rounded than in *P. meyeri*: fringe of bristles well developed. Meso- and meta-nota with bristles anteriorly. Wing-pads slightly lighter than the nota, veins indicated by faint pigmentation and lines of short stout bristles; a distinct pale area on the basal side of the transverse cord.

Legs stout, greyish-brown, covered with bristles. Anterior surface of fore femur with a distinct pale patch as in *P. meyeri*. Tarsi not conspicuously darkened dorsally.

Abdomen cylindrical; segments 1-6 divided into tergum and sternum. Each tergum covered with clothing hairs and fringed with bristles. Segments 3 or 4 to 7 with a dorso-lateral bristle on each side of the apical margin enlarged to twice or thrice the length of the other marginal bristles, as in *P. praecox*. Cerci slightly longer than the abdomen, faintly annulated.

Key to Nymphs of British Species of *Protonemura*.

Abdominal segments 1-4 divided into tergum and sternum .... *meyeri* (Pict.)
Abdominal segments 1-5 divided into tergum and sternum ...... *praecox* (Mort.)
Abdominal segments 1-6 divided into tergum and sternum .... *montana* Kim.

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HYMENOPTERA ACULEATA IN EAST DORSET.

By D. O. Boyd, B.Sc., D.I.C.

For obvious reasons, it has only been possible to collect in my own immediate neighbourhood during the past year, and my excursions have been very limited. Fortunately this district is very rich in Aculeates, so that my collecting has been fairly productive.

I am recording the more interesting species in the hope that some, at least, of these records may be of interest to other collectors. In some cases I have cited the occurrence of common species, to indicate the extent to which the genus is represented. I have not attempted to work some genera (*Sphecodes, Halictus*, etc.), and indeed I have only collected the Apidae rather casually, so that my notes on these bees cannot be taken as indicating the true extent of the group. The Dryinidae, Embolemidae, Bethylidae and Formicidae I have omitted as I am ignorant of them.

The areas chiefly worked were a large sandpit on the northern end of Parley Common; Holt Heath (a small sandpit and an earth bank being the best localities there) and the neighbouring ground at Uddens; and the banks of the Stour at Hampreston. I am greatly indebted to Mr. P. Harwood for introducing me to the two former localities. The latter is chiefly notable for the old willow trees in varying stages of decay, one dead one being very rich in the wood-nesting Aculeates. A single visit was paid (on 3rd Sept., 1941) to the Goathorn district near Swanage. In spite of the late date, many Aculeates were found along a disused railway and in old claypits.

Chrysididae.

Hedychrum nobile Scop. Abundant in sandpit, Parley Common, June, 1942. This beautiful little Chrysid is particularly fond of the flowers of *Potentilla* sp. and is comparatively easy to catch on them. Otherwise it is very active and difficult to net.

Hedychridium roseum Rossi. Abundant on earth bank at Holt Heath, Aug., 1941.

H. coriaceum Dahlb. Same locality, Aug., 1941.

Spintharis neglecta Shuck. Abundant in sandpit, Parley Common, June, 1942.

Chrysis cyanea L. } Both these spp. abundant in all localities.
C. ignita L. }

C. succincta L. ♀, Goathorn, 3rd Sept., 1941.

C. viridula L. Occurs in sandpit, Parley Common, about nests of *Odynerus spinipes* L., in June, but is not so common as *S. neglecta*. Also at Holt Heath in June.

Sapygidae.

Sapyga 5-punctata Fab. A single worn ♀ taken at Ferndown, 10th June, 1941.

S. clavicornis L. Plentiful on old willows at Hampreston, June, 1942. I took a single worn ♀ at this locality on 20th July, 1941. Mr. Harwood kindly sent me some specimens he took at Crichel Woods on 7th June, 1942.

Methocidae.

Methoca ichneumonides Latr. 1 ♀, Goathorn, 3rd Sept., 1941, and 1 ♀ in sandpit, Parley Common, 14th June, 1942.

Myrmosidae.

Myrmosa atra Pz. Abundant in all suitable localities, August, 1941. One ♂ was taken flying about a small birch tree on Holt Heath (near the sandpit) on 2nd Aug., 1941.

Mutillidae.

Mutilla europea L. One ♀, sandpit, Parley Common, 24th Aug., 1941.

Smicromyrme rufipes Fab. One ♀, sandpit, Holt Heath, August, 1941, and one ♀, sandpit, Parley Common, August, 1941. A single ♂ was taken in the sandpit at Parley Common on 27th June, 1942. Mr. Harwood, with whom I was collecting on this occasion, took three ♂♂.

Pompilidae.

Pompilus plumbeus Fab. Abundant on heaps of dredged gravel, Hampreston, 1941, and on loose sand in sandpit, Parley Common, 1941 and 1942.

P. spissus Schiödte. Sandpit, Parley Common, Aug., 1941.

P. trivialis Dahlb. Holt Heath, 3rd Aug., 1941.

P. consobrinus Dahlb. One ♂ on flowers of *Epilobium,* Hampreston Heath, 20th July, 1941.

Evagethes dubius V.d.L. Two ♀♀, Goathorn, 3rd Sept., 1941.

Anoplius fuscus L. Hampreston Heath, 18th May, 1941; sandpit, Parley Common, 30th Aug., 1941.

A. nigerrimus Scop. On heaps of dredged gravel, Hampreston, 27th July, 1941.

A. infuscatus V.d.L. Sandpit, Parley Common, Aug., 1941.

Episyron rufipes L. Fairly common, sandpit, Parley Common, Aug., 1941, and June, 1942.

Aporus unicolor Spin. One ♂ taken flying round small birch trees, Holt Heath, Aug., 1941.

Ceropales maculata Fab. One ♂ flying over heather, Holt Heath, 3rd Aug., 1941.

Vespidae.

Eumenes coarctata L. Abundant on heaths.

Odynerus spinipes L. Plentiful in sandpit, Parley Common, Aug., 1941, and June, 1942.

Ancistrocerus parietum L. Fairly common in sandpit, Parley Common.

Vespa crabro L. Appears to be common in this district. I have taken ☿☿ in Ferndown, and saw a strong nest in the thatched roof of a cottage at Pamphill (near Wimborne) in October, 1941. Mr. R. Howard brought me a ♀ on 24th May, 1942, which was found crawling on the carpet in his home at Stapehill.

Sphecidae.

Astata boops Schrank. Holt Heath, Aug., 1941.

Tachysphex nitidus Spin. Hampreston Heath, June, 1941; sandpit, Parley Common, June, 1942.

T. pompiliformis Pz. Sandpit, Parley Common, June, 1942.

Ammophila sabulosa L. Very abundant everywhere.
Podalonia viatica L. Sandpit, Parley Common, and Holt Heath, Aug., 1941; Goathorn, 3rd Sept., 1941.
Cemonus lethifer Schuck. Ferndown and Hampreston Heath, June and July, 1941.
Diodontus minutus Fab. Sandpit, Parley Common, 30th Aug., 1941.
Passaloecus insignis V.d.L. Dead willow, Hampreston, 27th July, 1941.
Mimesa unicolor V.d.L. Holt Heath, 2nd Aug., 1941.
M. schuckardi Wesmael. Sandpit, Parley Common, 13th June, 1942.
Psenulus atratus Fab. Dead willow, Hampreston, 27th July, 1941.
Oxybelus uniglumis L. Abundant on all suitable ground.
Crabro scutellatus Scheven. Sandpit, Parley Common, Aug., 1941, and June, 1942.
Coelocrabro pubescens Schuck. One ♂ flying around small birch trees, Holt Heath, Aug., 1941.
C. cetratus Schuck. Dead willow, Hampreston, July, 1941, and June, 1942; Stapehill, 21st Sept., 1941.
C. ambiguus Dahlb. Dead willow, Hampreston, July, 1941.
C. leucostomoides Richards. Holt Heath, 14th June, 1941.
Crossocerus wesmaeli V.d.L. Sandpit, Parley Common, Aug., 1941.
Hoplocrabro 4-maculatus Fab. Abundant in sandpit, Parley Common, Aug., 1941.
Clytochrysus cavifrons Th. Abundant, Hampreston and Stapehill, July, 1941.
C. chrysostomus Lep. & Br. Common, Hampreston, July, 1941, and June, 1942.
Nysson dimidiatus Jur. On *Daucus Carota* L., Ferndown, 30th Aug., 1941.
Hoplisus laticinctus Lep. Sandpit, Parley Common, 10th Aug., 1941.
Harpactus tumidus Pz. On *Daucus Carota* L., Ferndown, 30th Aug., 1941.
Cerceris rybyensis L. Sandpit, Parley Common, 24th Aug., 1941.
C. quinquefasciata Rossi. Abundant, Holt Heath, Aug., 1941.
C. cunicularia Schrank. Hampreston Heath, July, 1941; Parley Common, Aug., 1941.

Apidae.

Andrena marginata Fab. Two ♀ ♀ (very worn) on *Scabiosa* sp., Stapehill, 21st Sept., 1941.
Melitta tricincta Kirby. One ♂ on *Trifolium repens* L., Sandpit, Parley Common, 9th Aug., 1941.
Macropis labiata Fab. Both sexes on *Lysimachia vulgaris* L., Uddens, 2nd and 3rd Aug., 1941.

Panurgus calcaratus Scop. Abundant on Composites, Hampreston Heath, and Holt Heath, July, 1941.
Dasypoda hirtipes Fab. Parley Common (on *Leontodon* sp.), Aug., 1941, and June, 1942.
Anthophora retusa L. Abundant, Hampreston Heath, May, 1941.
Melecta punctata Fab. Hampreston Heath, May, 1941.
Epeolus cruciger Pz. Holt Heath, sandpit at Parley Common, and Goathorn, Aug. and Sept., 1941.
Nomada baccata Sm. Common, sandpit, Parley Common, Aug., 1941 ; Goathorn, 3rd Sept., 1941.
N. goodeniana Kirby. Fairly common, Hampreston Heath, May, 1941.
N. rufipes Fab. Holt Heath, Aug., 1941 ; sandpit, Parley Common, Aug., 1941.
Coelioxys elongata Lep. Sandpit, Parley Common, 28th June, 1942.
C. inermis Kirby. Sandpit, Holt Heath, Aug., 1941 ; sandpit, Parley Common, 13th June, 1942.
C. quadridentata L. Holt Heath, 2nd Aug., 1941 ; Goathorn, 3rd Sept., 1941.

SYMPETRUM FONSCOLOMBII (Selys) (Odon.).

By A. W. Richards, M.A., B.Sc.

As about thirty specimens of this species frequented Hawley Lake near Camberley (Hants) last summer (1941), I tried several times in April to obtain the larval form by dredging at a spot where I saw a ♀ ovipositing. I was unsuccessful, but on June 23rd I captured a very teneral ♂ near the pond, and two days later saw two others, one of which I captured. All were in a very teneral state, and of feeble flight. Although I saw the third specimen on subsequent days, no others appeared, and I searched the edge of the lake in vain for casts of skins or emerging imagines. At last a good number of freshly emerged 'sympetrums' appeared on July 7th, but all which I examined proved to be *Sympetrum s. striolatum* Charp.

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AN AUTHENTIC RECORD OF *MICRONECTA MINUTISSIMA* L. (Hemipt., Corixidae) IN BRITAIN.

By G. A. WALTON, M.B., Ch.B., F.R.E.S.

On June 3rd (1943) while examining Petit Jean's Island Pond in Longleat Park, North Wiltshire, large numbers of *Micronecta* were seen in the shallows. This fact in itself was interesting since no *Micronecta* have been found in this or the other three pools in Longleat Park during the last four years. Some of the *Micronecta* were captured and proved to be typical examples of *M. scholtzi* Fieb., and the *M. minutissima* would have passed unnoticed had not my ear caught the hissing sound usually associated with numbers of *M. poweri* D. & S. stridulating together. A more thorough collection immediately produced, not the common *M. poweri* (a species scarcely to be anticipated in semi-stagnant conditions in association with *M. scholtzi*), but *M. minutissima* L.

A count revealed 146 *M. minutissima* and 287 *M. scholtzi* in a random sample.

The previous evidence for the inclusion of *M. minutissima* in the British Lists was flimsy enough. Three faded specimens labelled Colchester were in the collection of the late Mr. Harwood and two faded specimens in the collection of the late Canon Fowler, devoid of locality data. I included it in the list of Hebridean Corixidae on the strength of a single female from the Island of Eriskay. These were the total British records.

The living specimens do not agree entirely with the description I gave in my paper 'The British species of *Micronecta*'; they are olivaceous rather than yellow, and are marked with quite distinct brownish streaks. The pattern of the markings and ground colour of the dorsum is very similar to the larger, more oval specimens of *M. scholtzi,* though the markings are more distinct. The ventrum is bright green, the scutellum yellowish and the central brown line on the vertex well marked, while the four black spots visible along the inner margin of the eyes of *M. scholtzi* are entirely absent in *M. minutissima.*

Petit Jean's Island Pond is about 350 yards long by 100 yards broad. A stream flows through the pool but despite this the water is rather cloudy. The bottom along the western bank where the *Micronecta* were found is firm and gravelly, with a sparse growth of small *Scirpi*. The fauna is in keeping with a semi-stagnant pool; it contains many fish, Roach, Perch, Eels, and both Carp and Rainbow Trout. While having *Microvelia reticulata* Burm., *Hydrometra stagnorum* L., *Gerris argentata* Schum., *Corixa falleni* Fieb., and *C. striata* L., it also contains the lacustrine beetles *Laccophilus minutus* L. and *Ilybius fuliginosus* Fab.

I wish to express my gratitude to the Marquis of Bath for the opportunity of studying the pools in Longleat Park.

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(2) Walton, G. A. 1942. The Aquatic Hemiptera of the Hebrides. *Trans. R. ent. Soc. Lond.*, **92** (2): 417-52, fig. 3.

AN UNDESCRIBED AQUATIC TIPULID (Dipt.) LARVA.

By G. A. Walton, M.B., Ch.B., F.R.E.S.

While examining various aquatic insects collected in 1940 by a class of Bristol University Zoology students from a small stony stream which flows through woodland at Failand, North Somerset, I found amongst some examples of the usual sluggish grey coloured larvae of *Dicranota* Zett. (Tipulidae, Diptera), a single transparent white iridescent specimen displaying great activity. On closer examination this specimen proved to have several marked structural differences from *Dicranota*.

On collecting in the stream I eventually discovered this animal in some numbers living in the intermediate layer between soft silted mud and the underlying sand banks submerged at the edge of the stream. They burrow through the sandy mud in a rapid and vigorous manner, progressing by a series of quick jerks, and when placed on top of sand will disappear with amazing speed. When kept in an aquarium they frequently lie in the mud with the last two or three segments protruding, but dart down into their tunnels at the slightest sign of danger.

In structure these larvae, the largest of which are nearly two centimetres long by two millimetres broad, are cylindrical, pointed at both ends (Fig. 17 A) and completely lack any trace of false legs. Like the larvae of *Dicranota*, the head is retractile (Fig. 17 B, C) and is provided with a pair of strong curved toothed

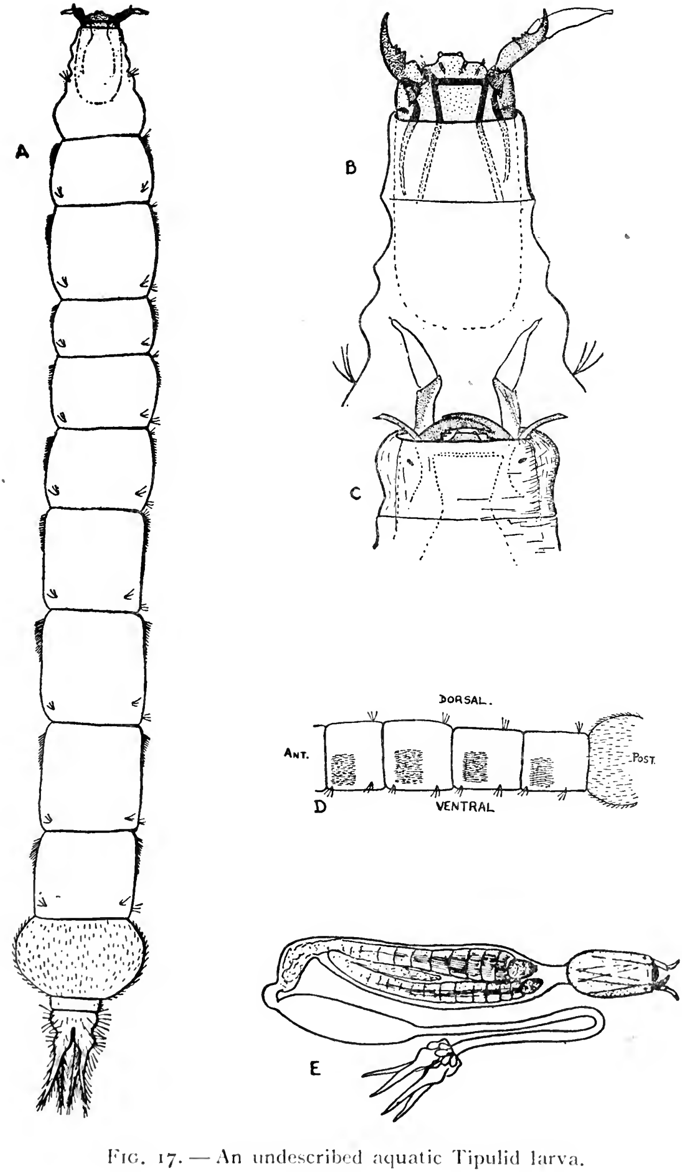

FIG. 17. — An undescribed aquatic Tipulid larva.

mandibles. Unlike *Dicranota,* besides having no false legs, this larva has four tapering hairy anal cerci of the same length, not two, and has also four small fleshy bulbous circum-anal gills (Fig. 20 E). Each of the main body segments possesses a roughly rectangular patch of fine backwardly-directed iridescent golden spines situated on the anterior ventral aspect ; two small groups of about three slender lateral setae, anterior and posterior, and one dorsal lateral posterior group (Fig. 20 D). The penultimate segment is expansile and can be inflated to the shape of a sphere. This segment is clothed with numerous short fine forwardly-directed hairs, and functions as an anchor against the sides of the animal's burrow when it wishes to retire or change direction, and also to prevent it sliding backwards in its burrow when thrusting its head forward through the sand or mud.

It was impossible to see the animal feed, but Fig. 20 E shows the digestive tract of a specimen containing the entire bodies of two small Chironomid larvae. Its whole appearance suggests predacious habits.

This Dipterous larva is to be found at all times of the year, but I have so far failed to discover the adult fly or the pupa. A running water aquarium will be necessary to rear it, as the specimens I have kept in stagnant water have all died about August.

It is to be presumed that the adult fly will belong to a Tipulid genus related to *Dicranota*. Further attempts are being made to rear it in captivity. Mr. H. Audcent, M.Sc., has kindly looked through his considerable collection of literature on the Tipulidae and reports that he can find no mention of a Dipterous larva fitting this description.

ROBIN (*ERITHACUS RUBECULA MELOPHILUS* Hartert) ATTACKING *AMATHES CIRCELLARIS* Hüfn. (Lep.).

By W. Parkinson Curtis, F.R.E.S.

On 2nd November, 1940, whilst gardening I disturbed an *Amathes circellaris* Hüfn. which was hiding in a small accumulation of apple leaves. The robin which usually superintends my gardening activities, even to the extent of sitting on my rake handle whilst I am using that tool, promptly dashed at the insect, brought it to the ground, rubbed the bulk of the hair off against a small stick that was upright in the ground, and then ate the insect, including the wings. As a rule birds reject the wings. I was surprised that the robin should tackle as large an insect as *Amathes circellaris* without hesitation, and I was even more surprised that it swallowed it without tearing it to pieces, as it practically bolted it whole.

EUPITHECIA VENOSATA Fabr. race *HEBRIDENSIS* n.f. (Lep.).

By W. Parkinson Curtis, F.R.E.S.

In the collection of the late Mr. Alan Druitt, which Mrs. Druitt has with great generosity presented to me, are six specimens of this species which came from the collection of the late Dr. Philip Brooke Mason. They all emanate from the Island of Lewis, and save for being slightly paler in the ground colour and by reason thereof showing more contrast, are fairly represented by the figure of Culot (1919, Noctuelles et Géomètres d'Europe, **4**: 11, pl. 39, fig. 797). Culot calls attention to the large size and extreme accentuation of the designs.

Gregson named three forms from the Orkney and Shetland Islands, viz. *fumosae* (1887, *Young Naturalist,* **8**: 111), *bandanae* (1887, *Young Naturalist,* **8**: 111), and *ochracae* (1886, *Young Naturalist,* **7**: 152), but none of these forms is at all like these specimens. Gregson's names are discussed by Mr. L. B. Prout (1907, *Entomologist,* **40**: 171), which discussion is for some obscure reason quoted by Seitz (1916, Macrolep. of World, **4**: 440) as if it were Gregson's original reference.

These specimens are the most striking and beautiful form of this attractive species that I have seen.

Research has not brought to light any name for the form. The admittedly incomplete evidence available to me points to the form being a distinctive and probably endemic Hebridean product. Of all the forms of the species that I know it is that most deserving a name, and I propose therefore for it the name **hebridensis.**

I have selected specimen 28296 in my collection as the type specimen of this race. This specimen will in accordance with my usual practice in these matters be deposited at the British Museum (Natural History) at an early opportunity.

EUPITHECIA TRIPUNCTARIA H.-S. (= *ALBIPUNCTATA* Haw.) (Lep.).

By W. Parkinson Curtis, F.R.E.S.

Standing in a series of *Eupithecia satyrata* Hübn. in the collection of the late Mr. Alan Druitt was an odd-looking little insect taken by him at Farran, County Cork, Ireland. In appearance, size and shape it looks almost like a very dull brown specimen of *Pyrausta cespitalis* Schiff. It has the markedly triangular forewing of that species with the somewhat grizzled

appearance of a specimen of *Erynnis tages* L., being nearly the average brown tone of that species with the admixture of whitish scales that species possesses. There is a named variety of *tripunctata,* viz. *angelicata* Barrett (1877, *Ent. mon. Mag.,* **13**: 278), and this is described as being almost uniformly smoky black with the discoidal a still deeper black. This specimen is sepia (Ridgway, Pl. XXIX) and, if held in such a way that it is lighted obliquely, it is seen to be decorated with punctiform dark lines, the intervening spaces being thickly irrorated with a semation of white scales with a lavender tinge. The markings are very obscure but there seem to be present a basal, subbasal and antemedial line. There is certainly a median fascia divided by the sepia scaling. There are distinct traces of a postmedial line followed on the nervures by dark sepia dots, that on vein 2 being square and quite comparatively conspicuous; the whitish festooned subterminal line so characterstic of this species is distinctly traceable, as is the tornal spot. I cannot trace any discoidal spot, nor are the costal markings usually present in the species noticeable. The terminal line is dark sepia. The fringes are very strongly chequered, being white with strong intersections of sepia at the termination of the nervures. The hindwings are sepia and almost as dark as the forewings; it is possible to make out light basal, medial and subterminal lines which give the hindwings the appearance of being pale sepia with two darker bands, a deception a low-power lens readily resolves. The chequering of the fringes is less pronounced on the hindwings than on the forewings. Dissection solved the puzzle, since it proved the specimen to be an aberrant ♀ *tripunctaria* H.-S. The specimen is 28360 in Mus. Curtis. The preparation slide No. 660.

Unless this form can be shewn to be of regular occurrence in Ireland or elsewhere, and not to be (as it at present appears to be) a casual aberration, it ought not to be given a name.

REMARKS ON SOME LASIOCAMPID NAMES (Lep.).

By W. Parkinson Curtis, F.R.E.S.

Malacosoma neustria Linn.

In connection with the continuation of my Dorset list, I have been examining a number of specimens of this species in order to determine so far as I was able the range of variation in Dorset. In so doing I have had occasion to compare Dr. K. Grünberg's treatise in Seitz, 1911, Macrolepidoptera of the World, **2**: 150, with Tutt's, 1900, British Lepidoptera, **2**: 546.

Dr. Grünberg (loc. cit.) gives an aberration *unicolor* Aigner, which is said to have the bands 'obsolete or absent.' I assume Dr. Grünberg intends by the first word 'obsolescent,' since if he does not the two words are tautological. However, based on this name of Aigner's, he treats *unicolor* Tutt as requiring a new name, so he christens it *concolor*. The mental processes by which this result has been arrived at completely floor me.

Through the industry of Dr. Hobby I have been enabled to run Aigner's name to earth, and through the kindess of Capt. N. D. Riley I have got a translation of it. The author's full name is Aigner-Abajü Lajos. The work is "Uj magyar lepealakok,' and it appeared in Rovartani Lapok, Budapest, 1906, **13**: 69-75.

The translation seems to read correctly as follows: 'This aberration without a description' (or possibly figure) 'has been mentioned for a long time in the catalogues by this name, which I now want to introduce into the literature. It can be found all over the country.' Capt. Riley tells me that there is no figure of the aberration in connection with this description. First of all I ask, 'What precise information does the above description convey?' The answer I should make is that it is an aberration without a description and a name *unicolor* has been used in catalogues. Very obviously the name without a description is a nomen nudum without any standing. The second question I would ask is, 'What has Aigner done to define it in any understandable manner?' The answer again is precisely nothing. Yet Dr. Grünberg proposed to inflict this name upon us and sink Tutt's *unicolor*, which has six years' precedence. As far as I am concerned I shall maintain, first, that it is a synonym and must sink; secondly, that it is devoid of description, is a nomen nudum, and müst be ignored; and thirdly, that neither Aigner nor Grünberg have done anything to attach any understandable conception to the name, and I for one am not prepared to recognize any name that does not convey some precise meaning.

Grünberg and some of the other continental writers in Seitz wax sarcastic about Tutt's colour names, but if they had taken the trouble to master Tutt's very excellent reasons for endeavouring to establish systematic names with some real meaning they would have had to admit that their remarks were otiose. It was precisely because the literature was getting overloaded with undefined catalogue names and dealers' names that Tutt took the stand he did. Tutt (loc. cit.) gave five names for the *unicolor* forms, one for each of the five different shades of ground colour, so that Aigner's name, if it be intended as Dr. Grünberg states to be one of the forms with obsolete markings, must fall to one of the five names given by Tutt.

Grünberg (loc. cit.) substitutes *concolor* for *unicolor* Tutt, and states that it is uniformly brownish-yellow. Tutt perfectly clearly states that *unicolor* is yellow or buff. Grünberg's brownish-yellow can only be fawn, since that is the only type of hue that is brown-yellow. Tutt had already named that form *cervina-unicolor,* so that Grünberg's *concolor* is an unwanted name and in any event was incorrectly applied.

Le Charles (1926, Amateur de Pap., **3**: 64) erected still another name, *interrupta*. He carefully abstains from giving the ground colour, but it is as certain as the fact that night follows day that that name must fall to one of Tutt's five *fracta* names, so that name also is redundant.

Tutt might well have been excused for missing Aigner's name published in a language little understood by the majority of Europeans, but there is no such excuse with regard to Tutt's name published in ample editions in a language which is the language of more than half the literature available on entomology.

Sibille's name of *bicolor* seems to stand on a little stronger ground. This was published in Lambillonea, Oct. 1927, **27**: 74, and it runs as follows:

> 'Areâ basali paleaceâ, fasciâ medianâ brunneâ sed cum umbrâ distali paleaceâ circumdante,釋externâ autem regione brunneâ. La partie basali est de couleur paille jusqu'à la bande mediane; cette dernière est brune comme l'aire extérieure, dont elle est séparée sur une ombre paille.
>
> ♂ Logue-sur-Ourthe, le 22 Juliet 1908.

Apparently this aberration is in fact one that had not come before Tutt. The type of brown is not stated, but I gather from the description—though I admit this is rather guessing—that it would fall into Tutt's 5th section. Apart from the basal colour the residue of the wing appears to be normal for ab. *pyri* Scop. The description conveys to me that the wing basad the antemedial line is pale, with the residue of the wing normal with the two usual pale lines. This seems to be a recurrence of the Lachneid 'epaulette' that Tutt regards as a normal Lachneid character, and to be much the same in character as the pale basal area of the wing that is prevalent in *M. castrensis* Linn. in the French Alps, which in the ♀ sex I have always referred to *rufo-virgata* Tutt.

Lasiocampa trifolii Esp.

In Dorset I know only the eastern sand dune colonies and the very much rarer heath specimens. These are generally of the deep fox-red brown of Tutt's last group. Any other form is

rare, but Tutt's three named forms do not cover the most prevalent Dorset form, which is parallel with *unilinea-typica* Tutt (1902, Brit. Lep., **3**: 12) but is the fox-brown and not the red-brown. I take Tutt's reddish-brown to be 'hazel' (Ridgway XIV), whilst I think his fox-brown is a colour a trifle redder than 'liver-brown' (Ridgway XIV)—much the tone that liver-brown would produce if a touch of Indian red were added to it. On that assumption it wants a name parallel to *unilinea-typica* to cover fox-brown specimens which only have post-medial line developed and not the basal line.

Accordingly I propose **unilinea-rufa** and select 8456 ♂ and 8457 ♀ coll. mihi as the types of the respective sexes of this form. The Dorset specimens are close to those I have seen from Blundellsands, near Liverpool, but far darker than the brown types I have from several localities in the French Alps. On the other hand, they have no tendency to produce the beautifully variegated forms that occur at Lydd, Kent, and in Syria and Palestine.

Gastropacha quercifolia Linn., form *alnifolia* Och.

Tutt (loc. cit.) **3**: 206 sets out Ochsenheimer's description in English translation and not in the original German. One of the points of that description is that the dorsal area of the forewing is 'rust-brown.' The figures given in Seitz (loc. cit.), pl. 27c ♂ ♀, shew no 'rust-brown' and therefore do not comply with Ochsenheimer's diagnosis. In fact, the figures are a nearly unicolorous dull purplish-brown and cannot be brought within Ochsenheimer's description by any exercise of reasonable latitude.

VOLUCELLA ZONARIA PODA (Dipt., Syrphidae), TWO FURTHER BRITISH RECORDS.

By Capt. E. Rivenhall Goffe, R.A.O.C. (retd.).

In a recent letter the Rev. E. M. Reynolds, Fifehead Neville Rectory, Dorset, informs me that he took a female of this species at Lodmoor, near Weymouth, Dorset, on 2nd July, 1941. The insect had settled on a young ash sapling in a copse and appeared to be freshly emerged.

Mr. Reynolds had seen the specimen taken by Dr. C. D. Day in Dorchester the previous year (Day, 1941) and was on the look-out for it. The locality is only some 4 to 5 miles from Dorchester. Mr. Reynolds states that he has never seen the hornet in that area, and nests of hornets so close to Weymouth and Dorchester would be ruthlessly destroyed. It would seem more likely, therefore, that the larvae had fed up in nests of wasps.

Mr. H. L. F. Audcent, Clevedon, Som., has also written that amongst some Diptera sent him for determination from the Bristol district is 1 ♀ of this species. It was taken on a window in the Redland district of Bristol during the third week of July, 1943. The specimen has been placed in the Diptera collection of the Zoological Dept. of the University of Bristol.

These captures, with those of Dr. Day, and of Dr. Sharp in the New Forest (Scott, 1923), give us four authentic British records in recent years, and make it possible to view the older doubtful records from near Edenbridge, Kent (Haines, 1932), off the Kentish coast (Jenkinson, 1901) and New Forest (Verrall, 1901: 671) in a new light.

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CALLICERA RUFA SCHUMMEL (= *YERBURYI* Verr.) (Dipt., Syrphidae): AN UNUSUALLY EARLY RECORD, and CAPTURE OF A MALE.

By Capt. E. Rivenhall Goffe, R.A.O.C. (retd.).

Mr. P. Harwood, writing from Aviemore, Inverness-shire, informs me that he captured a male of this interesting fly on 19th June, 1943. The insect was settled on the lee side of an old birch tree on the hillside opposite Loch Vaa, which is some four miles north of Aviemore and about two miles north of Granish, where Mr. Harwood had taken a female specimen in August, 1929.

Mr. R. L. Coe, when recording his discovery and captures of this species near Braemar, Aberdeenshire (Coe, 1938), listed the previous captures then known to him—8 ♀♀, all taken in the month of August. To these must be added 1 ♀ labelled 'Aviemore, 11th Aug., 1912, B.E.J.R.,' from the late B. S. Harwood's collection and now in the possession of Mr. P. Harwood. Mr. Coe's captures, 7 ♀♀, were also made in August.

In 1933 a specimen of what appeared to be this species was seen near Granish on 27th June (Goffe, 1934: 13), but in view of the early date the observation was considered to be doubtful.

In 1937 a capture of 1 ♀ was made in July—exact date not recorded—(Kevan, 1942), this being the first capture to be made prior to August.

The present capture on 19th June is easily the earliest on record, and enables the 1933 observation to be viewed with less doubt than hitherto.

Mr. Harwood's capture has a further interest in that it is the first occasion on which the male has been 'taken' in Britain. *C. yerburyi* was described by Verrall (Verrall, 1904, 1913) from females only, and the male was unknown until it was bred by Coe (Coe, 1939) and the synonymy with *C. rufa* Shml. established.

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MALES OF *SZILADYNUS DISTINGUENDUS* Verr. (Dipt., Tabanidae) HOVERING IN EARLY MORNING SUNSHINE.

By Capt. E. Rivenhall Goffe, R.A.O.C. (retd.).

In a recent letter from Aviemore, Inverness-shire, Mr. Philip Harwood makes the following interesting observation :—

'I expect you know that at least one species of male Tabanid hovers like a Syrphid. I noticed several which I took to be *S. distinguendus* Verr. fairly early in the morning, but they entirely disappeared before mid-day (d.s.t.). I concluded that they would normally be about long before I was, so I got up at 7.00 hours on two mornings early in the month (July, 1942) and found them hovering in numbers in the first patches of

sunlight which penetrated between the forest and the burn. I took 14 and 12 respectively, and found them much easier to catch in the crisp early morning air than later on. I also took several sitting on the posts of the forest fence together with 1 ♂ of *Tabanus sudeticus* Zell.'

The burn, at the point referred to by Mr. Harwood, runs almost due east, through scattered undergrowth, with an extensive deer forest a few yards back from its north bank, so that the forest edge and fence have a southerly aspect.

The hovering of the male of this species in the early morning had previously been noted by T. W. Kirkpatrick (1918, *Ent. mon. Mag.*, **54**: 18).

REMOVAL OF *CERIOIDES* **CONOP(S)OIDES* Linn. (Dipt., Syrphidae) FROM THE LIST OF BRITISH DIPTERA.

By CAPT. E. RIVENHALL GOFFE, R.A.O.C. (retd.).

Until recently this species was known in this country as *Ceria conopsoides* Linn. *Ceria* Fabr. was erected in 1794, but the name was preoccupied by Scopoli, 1763. Rondani, in 1850, proposed *Cerioides* in substitution, but the change was not made in this country, Verrall (1901) adhering to *Ceria*. During the last ten years or so, however, *Cerioides* has come into use under the influence of continental literature.

Ceria conopsoides is understood to have been brought forward as a British species by Dr. W. E. Leach. I have not traced any publication of this by him, but apparently the specimen was not identified specifically, as Samouelle (1819) states under *Ceria* ' there is one British species, that does not seem to have been described.' It was figured by Curtis in 1827 as *Ceria conopsoides* (Brit. Ent., 186) with the following remark :—

> ' The female figured in the plate, presented by Dr. Leach to the British Museum many years back, is the only indigenous specimen that has come to our knowledge; and I regret that I am not able to give its locality or any satisfactory account of its capture.'

Unfortunately no reliance can be placed on Dr. Leach's records, and the general opinion of entomologists is so well ex-

* This ' s ' was included in the original description. In 1907 Bezzi emended the name to *conopoides* on the ground that the final -s was the nominative suffix, the stem being conop-, but the emendation has only received partial adoption

pressed by Verrall (1901, Brit. Flies, **8**: 665) that I cannot do better than quote his words as follows :—

> 'Dr. Leach's contributions to the British Museum have always been unsatisfactory as it is believed that he confused continental specimens taken by himself when abroad with his British specimens.'

The species was listed as British in 1829 by Stephens in his 'Catalogue,' and in the same year by Curtis in his 'Guide.' Walker, 1851, included the species with the brief statement 'Rare, in the British Museum (E).' This (E) signifies from England. Verrall, 1901, dealt with the species in Vol. 8 of his 'British Flies,' though he omitted it from his 'List of British Diptera' published in the same year.

The species has remained on the British List on the strength of a single male in the Dale Collection, now in the Hope Dept., University Museum, Oxford. The specimen bears a single label 1220/1, the meaning of which was not understood until the discovery in 1938 of a number of Dale's books and journals. I then asked Dr. B. M. Hobby if he could find out something about this specimen; he went into the matter with his usual thoroughness, and the following is a summary of his report :—

> 'The number 1220/1 refers to Curtis' "Guide to an arrangement of British Insects" in which each genus is given a number and the species in each genus are numbered consecutively 1, 2, 3, . . . In this book *Ceria* is numbered 1220, *conopsoides* is no. 1. Against *conopsoides* is the sign ‡, which it is explained in the Preface* indicates that it is a species of which the author has only foreign specimens.
>
> Among the Dale books is a dissected copy of Curtis' "Guide" (Second Edition, 1837) which Dale used to indicate the specimens in his own collection and also in those of his correspondents. The entry for his own collection has the sign ‡ (in ink) against this species, and there is no entry against it for any other collection. The dissected copy is without the preface, but although Dale does not explain that ‡ means foreign he has given the totals for the first page at its foot :
>
> | | |
> |---|---|
> | "Species no. in J. C. Dale's | 15 |
> | Foreign species | 3 |
> | Desiderata | 6?" |
>
> On this page, three and only three species are marked ‡, so that it is clear that he is following Curtis in using the sign ‡ to denote foreign specimens.

* In my copy of Curtis' Guide, which is the first edition (1829), the second page of the Preface (which contains the explanation of this sign) is not in the front of the book, but is included in the Addenda et Corrigenda at the end.

Finally, a detailed manuscript catalogue of the collection, written in ink and following the numbering in Curtis' "Guide," has in pencil against *conopsoides* "J.C.D." in the column reserved for the collection, "1" in the column for the number of specimens, and "Foreign" followed by the sign ‡ in the column for remarks.

There can therefore be no doubt that the specimen in question has no claim to be a British one.'

It is clear, therefore, that there is no longer any justification for retaining *Cerioides conopsoides* Linn. in the List of Diptera occurring in the British Isles.

I wish to express my gratitude to Dr. Hobby for his valued and successful efforts to establish the real status of this supposedly British specimen.

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TABANUS (ATYLOTUS, OCHROPS) PLEBEIUS Fallen (Dipt., Tabanidae) IN CHESHIRE.

By Capt. E. Rivenhall Goffe, R.A.O.C. (retd.).

In my paper on the British Tabanidae (Goffe, 1931) I brought forward this species as British on the strength of specimens (1 ♂, 2 ♀♀) in the British Museum collection from Abbot's Moss, Delamere Forest, Cheshire. These had been taken by Mr. H. Womersley in July 1911, but the capture had not been published.

In subsequent correspondence (1931) Mr. Womersley informed me that he took a number of specimens, including 1 ♂, in 1917, but distributed them amongst friends. At the time he was collecting Collembola and other apterous orders, but took

these Tabanidae because he was not sure of their identity. He concluded that they were a small form of *T. rusticus* Linn., and it was not until about 1928 that he had heard from the late Major E. E. Austen at the British Museum that they had been determined as *Atylotus plebeius* Fall., and an addition to the British list.

One more female from Delamere, that is possibly one of those distributed by Womersley, has found its way to the British Museum in the collection of the late Col. T. Jermyn, as recorded by Oldroyd (Edwards, Oldroyd, and Smart, 1939).

From 1932 to 1939 I paid a number of visits to the Delamere district in June and July with the object of confirming this record, on the last occasion being accompanied by Messrs. J. E. Collin, F. W. Edwards and G. S. Kloet, but always with a negative result.

At the Manchester Congress of the Society for British Entomology in 1939 I asked Mr. Harry Britten if he or some of his friends of the Manchester Entomological Society would interest themselves in this matter, and this he kindly promised to do. From 1940 to the present year (1943) he and Mr. H. L. Burrows have paid numerous visits to Delamere and have succeeded in taking best part of a dozen specimens, including two or three males, one of which he has kindly presented to me. The dates ranged from 16th June to 28th July.

Mr. Britten states that this species, which is very small for a *Tabanus,* behaves somewhat differently from Tabanids generally. The females did not attempt to bite, or even to fly around him; and both sexes seemed reluctant to fly until roused, when they would fly sluggishly for a very short distance only — 20 yards at the most — or drop amongst the long grass or mossy tufts where the chance of finding them was *nil*. The first specimen seen was lost in this way.

This sluggish habit probably explains why dipterists generally have failed to find the species. Such an insect would be likely to be taken only by sweeping, a method much more often employed by students of other orders than by dipterists, and so would not be recognised unless (like Womersley) they happened to be general entomologists and to know something of the Diptera Brachycera.

The species will doubtless be found in other suitable localities in the British Isles now that Mr. Britten has shown us how to look for it.

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NOTES ON ODONATA IN THE BOURNEMOUTH AREA DURING 1943.

By LT.-COL. F. C. FRASER, M.D., F.R.E.S.

The year was a favourable one for Odonata although war conditions were not conducive to collecting or to such observation which might have been possible in more normal times.

Oxygastra curtisii (Dale).

The Hern habitat (Hants) was visited on four occasions during June and July, the whole ground being thoroughly combed, where I had taken the species in former years, without seeing a single specimen. I finally worked through a small wood which had never produced specimens before, and was just about to give up the hunt when I caught sight of a specimen in full and erratic flight. Fortunately a cloud obscured the sun at that moment and the insect, a fine female with deeply coloured wings, came to rest in the heather close to my feet. I caught and examined this specimen for any archaic formations in its venation and found that there was an accessory vein in the bridge of the left forewing and that the discoidal cell of the right hindwing was four-sided and traversed by an oblique vein : the rest of the venation was normal.

Libellula fulva (Müll.).

This species was in great numbers at Hern this year and appears to have established itself strongly again. It was seen both over the heather, in woods and over the River Moors. Unlike others of the genus, it breeds in running water, muddy-bottomed streams being preferred.

Ischnura pumilio (Charpentier).

On receiving information from Dr. Killington that he had discovered a small colony of *Ischnura pumilio* on a Dorsetshire heath this year (1943), I proceeded to explore likely habitats on the heaths around Bournemouth. On July 4th I found one such colony in a marsh just inside the Hampshire border, but only three females were seen, of which two were of the teneral primitive orange colour and one, nearly adult, of a bluish-green ground colouring. On the 7th I discovered a larger colony in a sphagnum bog bordering the Bourne River and on the Dorset side of the inter-county boundary. Here full adult males and females were found but no orange forms of the latter. Specimens were seen in this latter habitat up to the 28th July, when they finally disappeared. I have to confess that I had been

aware for some years of the presence of Ischnuras in this bog, but had always taken it for granted that they were of the common species *elegans,* as these were in great numbers over a pond some two hundred yards away. The encroaching building areas bid fair to overrun and destroy these colonies within a few years, but I have no doubt that more colonies will be found if Canford heath be thoroughly searched. Owing to the extremely small area which each colony occupies, over-collecting will easily destroy any of them in a single season.

Aeshna mixta Latr. and *Aeshna cyanea* (Müll.) pairing.

On a date in the third week of August, I watched a male *Aeshna cyanea* (Müll.) seize a female of *Aeshna mixta* Latr. The two flew off together, the male holding the female by her head, but the latter making no efforts to complete coitus : rather did she struggle violently to free herself, and this was in striking contrast to the behaviour of a female *Cordulegaster boltonii* (Don.) which I observed placed in similar embarrassing circumstances and which hung passively, trailing its body beneath the *A. cyanea* which had seized it (*J. Soc. Brit. Ent.,* **1**: 117). The two insects flew off and were lost sight of over the brow of a neighbouring slope, so I do not know what happened thereafter.

Aeshna grandis (Linn.), which used to be so common over this same habitat (Coy Pond, Bournemouth), has disappeared entirely, no doubt owing to the encroaching built-up areas and the consequent destruction of the Talbot Woods. *A. juncea* (Linn.) is also becoming increasingly scarce, probably from the same reasons. On the other hand, I was pleased to notice the first appearance of *Brachytron pratense* (Müll.) in Bournemouth, which is now breeding in the static waters caused by the damming of the River Bourne for A.R.P. purposes. The flooding of the Corporation Gardens has led to a rapid reversion to the primaeval fen-like conditions, with the consequent inrush of many hitherto long banished insects. *E. cyathigerum* (Charp.), *I. elegans* (Van der Lind.), *C. puella* (Linn.) and *S. striolatum* (Charp.) are all now breeding where, three years ago, smooth, close-cut lawns were to be seen.

Sympetrum fonscolombii (Selys).

This species, so common last year, has not been recorded in this ; and this is the more remarkable since the year 1943 is like to go down as a record one for immigrant species of insects. It serves to emphasize my point that emigration is not determined by favourable seasons, but by overcrowding from the piling up of populations over a number of years.

NOTES ON SPHINGIDAE LARVAE.

By Lt.-Col. F. C. Fraser, M.D., F.R.E.S.

On the 9th October, 1943, I was surprised to beat a nearly full-grown larva of *Smerinthus ocellatus* Linn. from sallow at Bournemouth. The lateness of the date is no doubt due to the larva being one of a second brood. Although *Smerinthus populi* Linn. is invariably double-brooded in Bournemouth, I have not found this to be the case with *ocellatus* before. A large number of larvae belonging to both of these species were bred this year, and whilst nearly half of the *populi* emerged during the end of July and August, not a single one of the *ocellatus* has done so. As the larvae were bred for the purposes of obtaining hybrids, I have been compelled to rear the second brood of *populi*.

Equally surprising has been the finding of a larva about to pupate of *S. pinastri* Linn. during the first week of October. As this species begins to emerge in Bournemouth during late May, there seems to be little doubt that this larva also belongs to a second brood. Larvae which I reared in June pupated in July this year.

A single larva of *Deilephila livornica* (= *D. celerio* Linn.) which was found by Mr. R. Wallace in Bournemouth in the middle of a ploughed field and feeding on a dried-up dock, pupated successfully after being put on a diet of vine leaves; but, contrary to expectations, has not so far emerged. The pupa, which is healthy and very lively, appears to be about to pass the winter in that state. Cornish specimens, I am informed, have already emerged. Larvae belonging to this species were found feeding on dock near Sherborne, Dorset, in an open field among oat straw rubble. The open character of the habitats should be noted by future collectors.

KIMMINSIA RAVA (Withycombe) (Neur.) AT BOURNEMOUTH.

By Lt.-Col. F. C. Fraser, M.D., F.R.E.S.

I have before reported the finding of *Kimminsia rava* at Bournemouth. This year, as the month of May approached, I kept a sharp look-out for the emergence of the species. On the 9th May, after a long dry spell, a heavy south-west gale set in with a big and sharp fall in the barometer: this was followed on the 10th by heavy and continuous rain, persisting for nearly twenty-four hours, but the 11th broke fine and sunny with the

barometer soaring rapidly. The meteoric sequence had been so favourable that I felt certain the emergence of *rava* would occur that day, and in order to confirm my conjectures I sallied forth at 7 a.m. to make a preliminary investigation of the tree trunks. I had been correct in my surmise, for there, about two to four inches from the foot of several trees, were a number of newly emerged specimens conspicuous by their opaque, white, unexpanded wings. I went back for my meal and returned two hours later to collect the spoil. Their wings were now fully expanded and dry and they were beginning to ascend the trunks, some in fact attempting to fly when I started to box them. Nineteen specimens in all were found, which is a greater number than I have found of this rare species in former years. The date, 11th May, 1943, compares with the 10th May, 1942, and 12 May, 1940. No specimens were collected in the year 1941 as I entirely missed the emergence. No adult specimens have ever been taken although I have persistently beaten for them, so that it is evident that the insects betake themselves to the upper parts of the pine trees so soon as they are able to fly. The insects emerge so low down on the trunks, and not more than two to three inches at the most when first spotted, that it seems evident that they pupate among the loose bark below ground-level. In this respect I have on several occasions found larvae of *Hemerobius stigma* Steph. a few inches from ground-level and making their way downwards as if to pupate in similar spots. Quite a number of this species have been found by myself emerging in similar localities.

As in former years, *K. rava* was accompanied in its emergence by numbers of the snake-fly *Raphidia maculicollis*. I can count on the fingers of one hand the numbers of adults of this species which I have beaten from foliage in Bournemouth, yet in the space of a few days, at this time, I could have collected well over one hundred. Thus, these insects also appear to spend their adult life in the tops of trees. I conclude that a new and interesting chapter in entomology might be opened by a young and active collector who is willing to risk life and limb investigating the fauna of our tree-tops.

Although the date of emergence is nearly always round about May 10th, I do not believe that this is so much due to a definite gestation period as to a suitable combination of meteoric conditions such I have given above, which serves to supply the so-called 'trigger,' action and awaken a dormant metabolism. How swiftly these metabolic changes flow is shown by the resulting mass emergence within a period covered by less than forty-eight hours!

MIMICRY IN *TRICHIUS FASCIATUS* Linn. (Coleop.).

By LT.-COL. F. C. FRASER, M.D., F.R.E.S.

Recently I have received a small series of the 'Bee beetle' *Trichius fasciatus* Linn. from Mr. Philip Harwood, who collected them at Aviemore, Inverness-shire. In the course of examining them, I have been struck not so much by their resemblance to an Aculeate as to an aggressive looking Arachnid. During flight, and when viewed from the front when at rest, there is

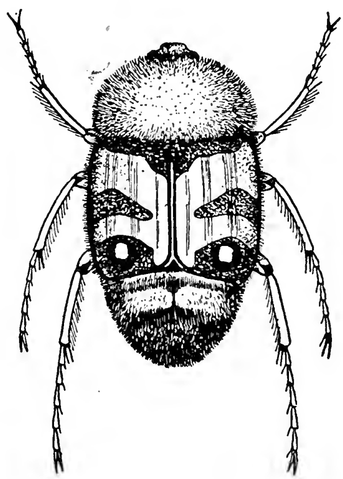

FIG. 18.—*Trichius fasciatus* L. shown, slightly forshortened and from the rear, to demonstrate the spider-like appearance. The eye-spots are two glossy black tubercles.

certainly a close resemblance to a bee; but if viewed from a postero-dorsal aspect, viz. in the attitude the insect assumes when it has its head buried in a thistle-head, a very striking resemblance to a formidable spider is seen. The mimicry is brought about principally through the medium of two glossy black raised tubercles situated one on each side of the postero-lateral angles of the elytra, and which, by reflecting the light, are pupil-pointed so that they appear to be very real eyes. The end of the insect's abdomen forms the spider's face and muzzle, the thorax, the abdomen, and the long trailing legs complete the picture. Mimicry in this case is unique in that two different

Arthropods are copied, thus serving to protect the insect both at rest and in flight. Moreover the means by which the 'eye-spots' are created is unique, viz. by the medium of raised glossy black tubercles which reflect the light as from an ordinary eye. I have consulted a large number of references to *T. fasciatus* but can find no mention of such mimicry having been noted before. Fowler, for instance, merely comments on the resemblance of the beetle to a humble-bee, especially during flight, and, in his description, mentions the 'apex of the elytron being raised into a round, blunt and shining tubercle.'

MECOSTETHUS GROSSUS (L.) and *CHORTHIPPUS BICOLOR* (Charp.) (Orthop.) IN SOMERSET.

By G. A. Walton, M.B., Ch.B., F.R.E.S.

While collecting aquatic insects in the peat cuttings near Shapwick, North Somerset, on 23rd August, 1942, I had the luck to capture a last stage nymph of the large grasshopper *Mecostethus grossus* (L.). It was hopping about among the *Juncus* tussocks growing on thick boggy peat close to an older undisturbed peat cutting in company with numerous specimens of the common grasshopper *Chorthippus bicolor* (Charp.). This species has not been found in Somerset before, although it has been recorded from Dorset and South Hants. The specimen has been examined by Dr. Uvarov, to whom I am indebted for confirming the identification.

A FURTHER NOTE ON *RANATRA LINEARIS* Linn. (Hemipt.).

By S. E. Hall.

In *J. Soc. Brit Ent.*, **2**: 121, I recorded the capture of a few specimens in June, 1941, in a small pool fed from a lake in Buxted Park, Sussex. In the following month of July I found a large colony of these insects in all stages of growth, from 5 mm. upwards, in the lake itself. On 25th August, 1942, I took one adult and two nymphs from a pond on Epsom Common, and on 15th April, 1943, six adults from the same pond. Placed in a large tank and given ample food, they seemed to thrive, but so far I have seen no signs of any eggs having been laid. Very occasionally one or two emerged upon the surface film for an hour or so, or climbed up the gauze frame that covered their

tank. They are evidently easily kept, provided a plentiful supply of food is always available, such as *Asellus aquaticus, Gammarus pulex* and Zygopterid naiads.

NOTES ON THE REARING OF DRAGONFLIES.

By S. E. Hall.

Aeshna cyanea (Müll.).

On 10th August, 1942, a female was trying to oviposit on the bare cement at the side of a small pond in my garden in South Croydon. She next tried some dry moss that covered part of the cement, but later examination did not show that she had been successful.

The dragonfly was caught and transferred to a large gauze-covered frame, under which I placed a shallow dish filled with damp moss. At once *cyanea* renewed her ovipositing efforts. Subsequently I added water to a depth of half-an-inch in the dish, and covered it with a sheet of glass. This was kept in an unheated greenhouse throughout the winter, the eggs, of which there were a great number, always being visible when the fine dust that had dropped out of the moss was slightly disturbed. It was clear, therefore, that *cyanea* had not in this instance placed her eggs within the thin cuticle of the moss, which was well above the surface of the water in the pond. On 25th April, 1943, dozens of tiny naiads were seen in the dish, approximately 2 mm. in length, so that the eggs had remained dormant for some eight months.

In Lucas' 'The Aquatic (Naiad) Stage of the British Dragonflies' (1930) there appears some doubt whether, as regards this species, 'the earlier laid eggs hatch in the autumn, the late ones in the spring.' One would have expected that eggs deposited early in the month of August would have hatched some time in the following September. The weather at that period in 1942 was certainly favourable.

I append a record of the first six ecdyses, which may serve to supplement that of this species given by Lucas, omitting the early moult directly after hatching :—

1.	3 mm.	15th May, 1943.
2.	4 ,,	27th May, 1943.
3.	8 ,,	20th June, 1943.
4.	16 ,,	3rd July, 1943.
5.	23 ,,	16th July, 1943.
6.	27 ,,	1st August, 1943.

(Rudimentary wing cases appeared.)

At this rate of growth it is obvious that emergence should take place in July, 1944, thus completing a full life cycle of nearly two years.

Orthetrum coerulescens (Fabr.).

On 27th July, 1939, a female was ovipositing in a small rain puddle on a footpath near Fleet Pond (Hants) accompanied by the male. I caught both in the net, and to my surprise the female shed her eggs into a glass tube of water as freely as does *Sympetrum striolatum* (Charp.). The naiads appeared from 17th to 20th of August, 1939. Artificial heat kept the temperature of the water round about 60° Fahr. in the daytime and 40° Fahr. at night through the greater part of the winter, although occasionally the lamp failed and the surface of the water was frozen at times. Growth was very slow at first, by mid-October the naiads varying in size from 2 to 3 mm. Eventually I managed to rear four, whose average growth was as follows :—

4 mm.,	mid-November, 1939.	15 mm.,	14th June, 1940.
5 ,,	9th February, 1940.	18·5 ,,	19th July, 1940.
10 ,,	11th March, 1940.		

Two females emerged on 19.vii.1940, a male on 20th July and another female on 26th July, some eleven months after the eggs were hatched.

ZOPHOMYIA TEMULA Scop. (Dipt., Tachinidae) IN WALES.

By G. S. Kloet, F.Z.S., F.R.E.S.

Amongst some material collected in Fairbourne, Merioneth, during June, 1942, was a female specimen of *Z. temula* Scop.

Wainwright records this specimen from Lyndhurst, the New Forest; Selsley, nr. Stroud; Calshot; Newmarket; and in numbers at the foot of Cader Idris, nr. Dolgelly. He states that it is proving to be fairly common locally, and it is perhaps not surprising that I took this insect at Fairbourne, Merioneth, which is approximately only nine miles from Dolgelly.

Mr. Britten very kindly determined my specimen, which has since been presented to him.

It has been decided to place this capture on record as it definitely extends the range of the insect to a coastal region.

References.

Wainwright, C. J. 1928. The British Tachinidae. *Trans. R. ent. Soc. Lond.*, **76**:617.
———— 1932. *Idem.*, first supplement, *op. cit.*, **80**:416.
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SYMPHEROBIUS FUSCESCENS (Wallengren) (Neur.) IN DORSET.

By F. J. KILLINGTON, D.Sc., A.L.S., F.R.E.S.

A single teneral male of this very local species was taken on 10th June, 1942, as it fluttered down from a high branch of a Scots pine in Branksome Chine, Parkstone. As far as I am aware this is the first recorded specimen for Dorset, although the species is almost certain to occur in other localities in the county.

BLACKBIRDS PREYING ON *PIERIS BRASSICAE* (Linn.) (Lep.).

By F. J. KILLINGTON, D.Sc., A.L.S., F.R.E.S.

Following a plague of *Pieris brassicae* in 1940, Prof. G. D. Hale Carpenter brought together a large number of observations of attacks by various birds mainly on this species of butterfly (1940, *Ent. mon. Mag.,* **76**: 224-229). The birds recorded with certainty as concerned in these attacks were blackbird, blue tit, cuckoo, great tit, greenfinch, house sparrow, pheasant, robin, spotted flycatcher and starling. In the same year I recorded extensive attacks by robins and sparrows on the July and August swarms of *P. brassicae* (1940, *Journ. Soc. Brit. Ent.,* **2** (2): 85-86).

There has been a fairly large spring brood of *P. brassicae* in South-east Dorset this year (1943) and I have been able to observe a number of attacks on the butterflies by a pair of blackbirds in my garden. The first observation was made on the 16th May, when a male blackbird came into the garden with a female *P. brassicae* in its beak, the butterfly being held by the body, the head and thorax inside the beak. The bird seemed in no hurry to eat its prey, and several minutes passed before the insect was dropped and the body partially devoured. The remainder of the body, with the wings attached, was then picked up and the bird flew away with it.

On several fine evenings during the following week the female blackbird was frequently in the garden, running about amongst the plants and making short darting flights upwards at the butterflies. Not more than 10 per cent. of the attacks were successful; in those that were, the bird seemed usually to seize the insects by the body or the bases of the wings. I did not see the female eat any of her captures (nine in all); she carried them away in her beak. From the 17th to the 23rd May the wings of

about twenty butterflies were found lying in the garden, although in these cases it is not possible to name the bird responsible.

As far as could be ascertained, female butterflies formed about 80 per cent. of the victims.

AGRION SPLENDENS (Harris) (Odon.) IN WILTSHIRE.

By Henry G. Morgan.

I notice that Miss C. Longfield in her 'Dragonflies of the British Isles' (1937) says of *A. splendens* that it has not been recorded for Wiltshire. I have recently found the species in numbers along the River Avon above Salisbury, where it is the commonest dragonfly. My impression is that it is quite common and widespread in the county. I remember seeing it in large numbers, in company with *A. virgo* (Linn.), on the canal at Bradford-on-Avon, in the same county, about ten years ago.

ODONATA ON ALDERNEY HEATH, POOLE, DORSET, 1943.

By F. J. Killington, D.Sc., A.L.S., F.R.E.S., and E. C. Bathe.

Alderney Heath is situated on the northern outskirts of Poole, Dorset. About three-quarters of a mile in area, it is traversed by two marshy valleys containing a number of small, shallow bog pools, two deeper ponds of open water, and many small runnels, the waters of which finally reach the small stream known as the River Bourne. It is an ideal area for the breeding of Odonata, and during the past year has been closely studied and regularly worked. The one bright spot of the year has been the discovery that *Ischnura pumilio* (Charp.) breeds here.

Zygoptera.

Lestes sponsa (Hans.).

This species was first observed by us on 3.vii.43. It seems to be a newcomer to the heath, for the emergences were all from one small, shallow pool, almost devoid of weed, except for a few clumps of cotton-grass. Later on it was found ovipositing in other pools, always preferring pools with upstanding plants but little other plant life.

Longfield (1937, 'Dragonflies of the British Isles': 152) says: 'While egg-laying the male holds the female fast by the neck, and lets her slowly down beneath the surface of the water,

holding her there while she plants the eggs in the stem she is clinging to, and helping to pull her up to the surface when she has completed her task.' We have many records of the egg-laying of this species, but have never seen the female enter the water. Usually eggs have been placed in the stem of the reed several inches above the water.

On 24.vii.43 we noticed one of this species in the clutches of an immature ♂ spider (?) *Araneus redii* Scop. The last date on which we recorded this species was 25.ix.43.

Pyrrhosoma nymphula (Sulzer).

From the first week in May until the end of July this species was very common in all parts of the heath. On several occasions we saw the female ovipositing entirely alone. A large percentage of the hundreds of imagines examined were infested with parasite larval mites (Hydrachnidae).

On two occasions *P. nymphula* was observed being preyed upon by spiders. On 16.v.43 one was caught in a web at the edge of a pool and was being attacked, while on another occasion, 2.vii.43, the attacker was a young specimen of the wolf-spider, *Dolomedes fimbriatus* Walck. On 23.v.43 we found an *A. imperator* Leach, ♂, preying on a *P. nymphula* ♂.

Ischnura elegans (Van der Linden).

Although there were two distinct emergences of this species, the first in June and the second in August, they were never very common, being only found in ones and twos scattered at all the different waters of the heath. They had all disappeared by the end of August.

I. pumilio (Charp.).

This species was first caught at one small pool on the heath, 11.vi.43, and although careful search was made, only a few isolated specimens were found at other pools. Although not large in numbers, it was commoner than *I. elegans* at this one pool, which appears to be the main breeding place on the heath. The female was observed ovipositing alone on a number of occasions without an attendant male. The flight is extremely feeble and fluttering, and this, together with its short season, no doubt accounts for its failure to spread and increase. The last recording was on 3.vii.43, when we saw two females, one of which was ovipositing at a pool lower down the marsh.

Enallagma cyathigerum (Charp.).

This species, first seen on 27.iv.43, was very common at the two open ponds. The months of greatest activity were June and July, and although there were signs of a second emergence in August it was a very small one. None was seen after the end

of August. On 2.vii.43 we found a male caught by the wings in a specimen of the sun-dew, *Drosera rotundifolia* L., growing by the side of one of the pools. On the same morning we observed a male attempting to copulate with a *P. nymphula* ♀. The attempt was unsuccessful. The next day a male of this species was found caught in the web of the spider (?) *Araneus redii* Scop.; the spider was feeding upon its prey.

Coenagrion puella (Linn.).

First seen on 9.vi.43, this species was not very plentiful but was found at all the pools of the heath. Its season was very short and the last recording was made on 2.vii.43.

Palaeobasis tenella (Villers).

This species, first recorded on 12.vi.43, was quite as common in all parts of the heath as *P. nymphula,* being found at pools and streams alike. Its peak month for numbers and activity was July. On 17.vii.43 we found a spider, *Theridion sisyphium* Clk., feeding on a male of this species, which had been caught in a very small web on a low gorse clump beside one of the pools. In August the numbers gradually dwindled and the last recording was on 2.ix.43.

ANISOPTERA.

Brachytron pratense Müller.

Although this species was not observed on the heath this year, a single specimen was seen flying not far away on 27.iv.43. This date suggests an early emergence.

Cordulegaster boltonii (Don.).

This species was fairly common and was often seen hawking far over the heath or in the vicinity of the small streams running through the valleys. It was first seen on 23.v.43, and the last specimen recorded was a very much frayed and worn male, caught on the heath far away from water, on 11.ix.43. On 29.vi.43 a specimen was found lying in a small stream, minus its head and with a large piece pecked out of its thorax, while floating on the water was a number of wings of the same species, suggesting attacks by birds.

Aeshna cyanea (Müller).

Although this species is usually very common, it was scarce this year, its season being very short. It was first seen on 2.vii.43, and the last observation was on 18.viii.43.

A. juncea (Linn.).

Has been very common this year, its first appearance being recorded on 17.vi.43, and from then until the end of September

was to be seen in numbers, but at the time of writing these notes (11.x.43) it seems to have disappeared. It was very active in pairing and ovipositing during August and September. Females have often been observed placing eggs in the upright, damp edges of the shallow pools. On the morning of 31.viii.43 two *A. juncea* which had been hunting over the surface of the water were seen to dart suddenly at a female dragonfly in an attempt to copulate with her. The three came to rest in the grass by the side of the pond and a melee ensued. We caught them and found that the female was *C. boltonii*. Copulation had not been achieved. On 2.ix.43 a female *A. juncea* was observed ovipositing in the centre of a small pool, when suddenly she went limp and still. On examination a ♀ marsh spider, *Dolomedes fimbriatus* Walck. was found sitting on the dorsal side of the thorax and feeding upon it. The dragonfly was dead. Two more marsh spiders were resting on a piece of floating débris, while on the surface of the water were the remains of other dragonflies.

A. grandis (Linn.).

A ♂ of this species was seen at the end of July hawking up and down a beat under the trees beside one of the small streams on the heath. This was the only specimen recorded.

A. mixta Latr.

Usually a fair number of this species is to be found on the heath, but this year one male was caught in mid-August and none has been seen since.

Anax imperator Leach.

The first of this species was a male seen on 27.iv.43, but it did not begin to appear in numbers until May. From then until the beginning of August they were very common over all the waters of the heath, and the period of greatest activity was June until the beginning of July, and emergences continued until mid-July. It was frequently noticed how a male on patrol over a pond would go for another intruding male and attempt to drive it off, the pair often engaging in a chase far ove the heath. If successful, the victor returned to his solitary bea. The intruder never seemed to make any attempt to fight it out but retreated as soon as approached, as if there was some instinctive recognition of the territorial claims of the other. Attempts to drive off *L. quadrimaculata* flying over the water at the same time were not usually successful. Another observation made was that a female of this species unwilling to copulate would turn the tip of her abdomen down as the male approached, and at this he would sheer off. On 2.vii.43 a male attempting to copulate missed

the female and plunged headlong into the weed on the surface of the pond, where he remained entangled for some seconds.

Orthetrum coerulescens (Fabr.).

From the first week of June until the first of September this species was to be observed in all parts of the heath. In June and July they were swarming and very active in copulating and ovipositing.

O. cancellatum Linn.

On two occasions in mid-June a specimen of this species was seen on the open heath making short flights and coming to rest repeatedly on small patches of bare stony ground. Attempts to capture the specimen were unsuccessful.

Libellula quadrimaculata Linn.

A single specimen of this species was seen on 27.iv.43, but the general emergence was not until May. At about 10 a.m. on the 15th of May we set out across the heath and found the pools glistening in the sunlight with dozens of this species, with outstretched wings, resting on reeds and drying after emergence. It was possible to pick them off the reeds quite easily. From then onwards they were very common, being most active in June. A number of the southern form with smoky wings was seen. On 20.vi.43, while watching them at one of the ponds, we saw one of them make an upward dart of quite two feet to capture a Crambid moth. On catching the dragonfly its jaws were found to be covered with white scales from the moth's wings, but the moth itself was in such a state as to render determination of species impossible.

L. depressa Linn.

Although usually common on the heath this species was scarce this year and had a very short season, being seen first on 28.v.43 and last recorded on 2.vii.43.

Sympetrum danae (Sulzer).

First appearing on 2.vii.43, there was a succession of emergences throughout July, August and September, and at the time of writing (11.x.43) there are still a few of this species about. It was very common on all parts of the heath. On 17.viii.43 we observed a ♀ spider *Araneus sericatus* Clk. feeding on a ♂ *S. danae* which was caught in its web. On 30.viii.43 we found another in a web being preyed upon by a ♀ *Araneus diadematus* Clk. On 31.viii.43 a pair in copula flew into a web and the spider, a ♀ *Araneus diadematus* Clk., pounced upon the female, which when taken from its attacker appeared to be dead but

later revived and lived until 2.ix.43, thus demonstrating the anaesthetic power of a spider's bite.

S. s. striolatum (Charp.).

This species was first observed on 18.viii.43. Although usually very common, there were very few on the heath this year. At the time of writing they are still occasionally to be seen.

S. fonscolombii (Selys).

In past years it has been seen upon the heath but it has not put in an appearance this year.

We wish to express our thanks to Dr. F. H. Haines, M.R.C.S., L.R.C.P., D.P.H., for the identification of the spiders mentioned in these notes.

PARARGE MEGERA Linn. (Lep., Satyridae), A LATE EMERGENCE.

By Capt. E. Rivenhall Goffe, R.A.O.C. (retd.).

At noon on 27th October, 1943, I saw a freshly emerged female of the Wall Brown butterfly *Pararge megera* Linn. in a meadow near King's Somborne, Hants. True to its popular name it was settled on the south side of a flint wall, enjoying the sunshine which has been such a continuous feature of this year's late autumn weather.

PARASITES CONTROLLING LARVAE LIVING AS SCAVENGERS IN NESTS OF WASPS AND HORNETS. AN APPEAL FOR COLLABORATION.

By Capt. E. Rivenhall Goffe, R.A.O.C. (retd.).

We have in Britain five species of the genus *Volucella* Geoff. (Order Diptera, family Syrphidae) whose larval stages are passed as scavengers in the nests of Social Hymenoptera. Whilst one common species (*V. bombylans* Linn.) is usually found in nests of *Bombus* species, all five have been found in nests of wasps or hornets, and the remaining four species have not been recorded otherwise. One of these (*V. pellucens* Linn.) is a common and widely spread species, and only one (*V. zonaria* Poda) is really rare in Britain, though common on the Continent.

Without control these insects would become excessively numerous in a very few seasons, yet there is only one published record of a parasite having been bred from them — by Boie in 1855, when he described the female only of a hymenopteron bred from an undetermined *Volucella* larva from Germany, *Phygadeuon volucellae* Boie (1855, *Stett. Ent. Zeit.*, **16**: 102). There is no British record. Mr. Claude Morley, to whom I am indebted for the above details, states that he knows nothing of this species, nor of any other parasites from *Volucella* species.

May I appeal to entomologists who have observed wasps' or hornets' nests in or near woods or forests to take any such nests containing scavenging larvae this autumn or winter, after they have been abandoned by their sting-bearing occupants, and to breed out both the flies and their parasites, so that this blank in our knowledge may be filled.

The writer will be only too pleased to hear from anyone having such material needing determination, and so, he is sure, would Mr. Morley.

A PRELIMINARY LIST OF THE HOSTS OF BRITISH TACHINIDAE (1942, *Trans. Soc. Brit. Ent.*, 8 (1)):

A CORRECTION.

By H. Audcent, M.A.

On p. 28, line 12, of my paper quoted above, I gave the date of a list of Hemiptera by China as '1941,' whereas it was then unpublished. '1941' should, therefore, be deleted and 'MS.' inserted in its place.

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JOURNAL OF THE SOCIETY
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NOTES ON *PRIOCNEMIS* Schdte. (Hym., Pompilidae) IN BEDFORDSHIRE.

By V. H. CHAMBERS, B.Sc., Ph.D., A.R.C.S., D.I.C.

Since the publication of Haupt's monograph of the European species of Pompilidae (1927), interest in this family of spider-hunting wasps has been revived in Great Britain, and several papers dealing with the separation of the species of *Priocnemis*, and other genera, have been published. The comparative paucity of our knowledge of this genus was demonstrated in the paper of Richards and Hamm (1939). This last communication stimulated the writer, who has been engaged upon a systematic exploration of the Aculeate fauna of Bedfordshire for the past dozen years, to pay especial attention to the genus.

In the first section is given a general account of the occurrence of the species, along with a few observations on their biology. Measurements of the smaller species are included, as it would appear that they vary in size in different parts of the country. These were made with an eyepiece micrometer in a low-power binocular microscope used as a monocular instrument. Details of measurements of the several head and thorax parameters, which have been used in the separation of the females of the species having a clear apical wing spot, are included in the second section, as it was thought that the data might be of value to a professional entomologist who might, in the future, when the material available for study is richer, draw up a full account of the British species. A $\frac{2}{3}$ in. objective with a No. 4 eyepiece and micrometer (one division = ·0188 mm.) was employed here; the figures given have an error of less than five per cent.

Previous writers have remarked upon the difficulty in catching these wasps, on account of their rapidity of movement and tendency to run on the ground rather than to fly. The writer has found the following simple method, applicable to the running insect, by far the most efficient. The wasp is stalked for a foot or two until it reaches a small clump of grass, small hole or similar slight cover, whereupon a 1 lb. jam jar is rammed down sharply

on to the ground. In most cases the insect will rise sharply to the top of the jar, or it can be induced to do so by waggling the jar about. The mouth of the jar is covered quickly with the other hand, which is withdrawn as the jar is thrust into a net. After shaking into the net, the insect can then be transferred to a small killing tube. The number of failures is insignificant compared with attempts to use a net directly, and much less time is wasted. Even if the wasp shows reluctance to leave its cover, it is at least isolated and can be readily located and tubed directly.

The writer is indebted to Dr. O. W. Richards for help given in the early stages of his acquaintance with the genus, and to T. H. Savory, Esq., for naming the spider prey.

Occurrence and Ecology.

1. **P. perturbator** Harris).

The earliest to appear, this fine wasp is of widespread distribution in the county, not being restricted to any type of locality. It is often found at hedge bottoms and on roadside verges, where the long grass fails to impede its rapid movement. Sunny banks with patches of *Nepeta* are one of its favourite hunting-grounds. On the lower greensand it has been taken in several localities, including open woodlands, at Clophill, on the drier parts of Flitwick Moor (a ferruginous peat-bog) and in a sandpit at Tingrith. Localities on the chalk marl are Sharpenhoe and the 'Litany,' Totternhoe, where it is especially abundant and constant in appearance on patches of *Nepeta*. In the extreme north of the county it occurs in Odell Great Wood, and in the extreme south at several places in the parish of Whipsnade, where regular yearly observations have been made along a particular hedge-bottom. From the varied nature of its habitats it seems liable to turn up anywhere.

Richards and Hamm (1939, p. 61) state that 'this is one of the Pompilids of which the fertilised female hibernates and appears very early in the spring. The males, the offspring of these females, do not emerge until later in the summer.' The writer's experience does not lend support to this. Both sexes have often been found together during the first week in May, when the species begins to be numerous. The earliest date for the ♀♀ is 3rd May, most of the writer's material having been taken during this month; the latest specimen was captured on 21st June. Along a hedge-bottom near Deadmansea Wood, Whipsnade, ♂♂ were first taken in 1940 on 28th April, in 1942 on 19th April and in 1943 on 18th April; in the latter year the species definitely had not emerged the previous week. Males have not been taken after 16th May. From these observations it would appear that the species appears in mid-April and lasts until June or later.

2. **P. coriaceus** Dahlb.

Represented by two ♀♀ taken at Totternhoe on 5th May, 1935 (identified by Dr. O. W. Richards), and a single ♀ on the same date in 1940 at Sharpenhoe, in both places at the foot of the chalk escarpment. Work on the spring species of *Andrena* has taken up all the writer's available time in spring in the past few years: it is hoped to obtain further information on this species later.

3. **P. exaltatus** (Fab.).

This is also a widely distributed species, not specially attached to any type of soil or locality, which, although usually found as single specimens, often on the umbels of *Heracleum, Angelica, Daucus* and *Pimpinella,* must be one of the commonest species of the genus. It has never been found in the profusion of its more locally confined relative *P. femoralis,* although often taken with it. Besides woods such as Warren Wood, Clophill; Kingswood, Heath and Reach (both greensand); Deadmansea Wood, Whipsnade (clay-with-flints); Marston Thrift (Oxford clay) and Odell Great Wood (boulder clay); it has been taken on chalk downlands at Beacon Hill, Shillington; Blow's Downs, Luton; Sharpenhoe Clappers and Galley Hill, Streatley. In addition, roadside specimens have been taken at Barton (chalk), and Clophill, Ampthill and Maulden (all greensand). Further greensand localities are Tingrith and Rushmere Heath.

The earliest date for captures are: ♂, 25th June; ♀, 8th July. Most specimens have been taken during July, but both sexes last well into August; the latest dates of capture are: ♂, 6th August; ♀, 3rd September. The species has therefore a fairly long flight period.

PREY: Warren Wood, Clophill, 16.viii.42: *Tarentula pulverulenta* ♀.

4. **P. femoralis** (Dahlb.).

Unlike the last, this species is restricted very definitely to woodlands or to their outskirts, where it is usually to be found in great profusion. The geological formation of the locality does not appear to be of much importance, as long as the soil is either a light sand or, if heavy clay, then the species is only found in spots where the drainage is good and the soil dries out readily in the summer months. Thus it is found on the greensand at Warren Wood, Clophill and Aspley Wood, Woburn. The former locality is a derelict open oakwood with chestnut coppice: in the latter, the species was found at the foot of a steep deforested slope in the immediate vicinity of a footpath where the soil is rather damper and more suitable for the growth of low herbs. On

the sides and top of the slope itself, although supporting a luxuriant growth of *Epilobium* and *Senecio sylvaticus,* the soil is much too well drained and *femoralis* could not be found. No spiders were seen here either. For similar reasons of dryness of soil, no doubt, this species has not been found on sandy heaths, in so far as these are present in the county. At Kingswood, Heath and Reach, situated upon greensand in part capped by boulder clay, the species is abundant upon both types of soil which are here quite clearly marked. Deadmansea Wood, where it is particularly abundant, and Ravensdell Wood, Studham, provide examples of soils of intermediate character upon the clay-with-flints, with upper chalk outcrop in the last locality. It is also found on the low-lying area at Totternhoe on the line of intersection of the chalk marl and gault outcrops — sometimes known as the 'Litany' — which is partly marsh and partly ancient scrub of hawthorn, blackthorn and elder. It is in clearings of the scrub that *femoralis* abounds. Finally, it has been taken in Odell Great Wood (boulder clay) and abundantly upon the really heavy Oxford clay of Marston Thrift. Spooner (1942) has taken it at Chicksands Great Wood, where the soil is of mixed origin, but mainly boulder clay upon greensand. With the exception of the Litany scrub, all these woods are remnants of more extensive forest, Deadmansea Wood being now but a fraction of its size a century ago.

In addition, this species, of course, requires direct sunlight, and is accordingly found either on the margins of the drives laid out in these woods for shooting purposes (it shows little tendency to hunt upon the drives) or where the shrub layer has been removed and the trees (usually oak) are in open canopy. In some localities it is therefore necessarily localised and hence might easily be overlooked. Unlike *Pompilus,* the ♀♀ are reluctant to run across patches of bare ground of more than one or two square feet in area, their hunting operations being confined to the vicinity of herbs such as *Nepeta, Fragaria, Ajuga, Scabiosa succisa, Veronica officinalis, Juncus* and mosses. Sometimes they hunt under the shade of growths of trailing *Rubus, Epilobium angustifolium* and *Cirsium arvense,* where they are much more difficult to find and catch. The ♂♂ are seen, and are much more readily caught, on the ground, but also sun themselves upon leaves at a height of a foot or so, and show a definite tendency to fly rather than to run over the ground.

Although the ♀♀ are often seen hunting it is only rarely that one is sufficiently fortunate to alight upon one dragging its paralysed spider prey backwards. A number of individuals, probably mixed with *cordivalvatus,* were observed hunting on patches of dried up moss in Kingswood on 12th August, 1943, some being kept under observation for twenty-five minutes. The wasps entered and inspected crevices in the moss and small pockets

filled with dead leaves, often returning to a spot already examined, pausing at intervals to clean their antennae and hind legs. Only on one occasion did a wasp make a dart at a small spider which seemed to leap only a few inches away, the wasp appearing to have no idea how to continue the chase, although the spider was perfectly exposed. Hunting was continued during overcast periods. Similarly fruitless and more prolonged watches, in spite of the great abundance of spiders, were made on a pure society of *femoralis* at the Litany on 19th August. Here hunting was carried out persistently at the bases of *Cirsium palustre* and even in the subterranean tunnels of small rodents. As previous observers have remarked, the species seems to share with other Pompilids extreme short-sightedness.

PREY. Marston Thrift, 13.vi.43, and Aspley Wood, 31.vii.43, both immature *Clubiona* sp., probably *brevipes*.

ACTIVE PERIOD. The dates of first capture, irrespective of locality, were as follows: 1940, 30th June, ♀; 1941, 19th July, both sexes; 1942, 17th June, ♂♂; 1943, 13th June, both sexes; the record for 1941 is not of much significance, as it was the first visit to the locality. In 1942 a close watch was kept for about an hour at weekly intervals upon a stretch of bank 14 ft. long with a sunny exposure in Deadmansea Wood and all captures recorded with the following results: 14th July, 13 ♂♂, 1 ♀; 21st July, 18 ♂♂, 2 ♀♀; 26th July, 2 ♂♂; 2nd August, 1 ♂, 2 ♀♀; 9th August, 2 ♂♂, 4 ♀♀; 23rd August, no ♂♂ seen; 29th August, only one ♀ taken elsewhere in the wood. The number of specimens taken in each month, in the writer's collection, are as follows: June, 23 ♂♂, 6 ♀♀; July, 49 ♂♂, 21 ♀♀; August, 13 ♂♂, 18 ♀♀; September, 3 ♀♀. The species has therefore a long active period of three months, commencing in the second week in June, becoming abundant by mid-July and lasting until September, ♀♀ having been taken on 7th September. The number of ♂♂ decreases towards the middle of August. However, on 19.viii.43 on the Litany (see above), there were many ♀♀ hunting and equally large numbers of ♂♂ about. Of the ten ♂♂ taken five had quite unbroken wing-tips and from their activity they had all the appearance of being freshly emerged. Moreover, one large ♀, before capture, was flying round in large circles clear of the ground as if it had not yet started hunting: on one occasion, when it settled, a ♂ made a dash at it as if for copulation. Although the records of both sexes form unbroken series, it is quite possible that the species has more than one generation or at least a 'staggered' emergence. The capture of ♂♂ towards the end of August in as fresh a condition as those taken in early June can only be accounted for in this way.

FEMALES (45 specimens). Vary in length from 5·1—8·1 mm. with one at 9·1 mm. Mean length 6·6 mm. The coloration of the

legs is practically limited to a slight testaceous flush on the front tibiae and extreme apices of the femora, not visible to the naked eye.

MALES (77 specimens). Length from 4·1 — 5·7 mm. Mean 5·4 mm.; standard deviation 0·53. The pale coloration of the legs is limited to a pale testaceous colour of the tarsi, greater part of tibiae and extreme apices of femora of the front pair of legs, just visible to the naked eye. None of the many individuals seen or captured has any trace of pale coloration on the abdomen. In the British Museum there is a ♂ ex Capron Collection similar in size and colour to the writer's specimens. Amongst the few other British Museum ♂♂ are some much larger specimens with extensive orange-yellow patches on the posterior femora and apex of basal segments of the abdomen, quite unlike the Bedfordshire material. It would appear that there may be geographical races or varieties of this species in Britain: further extensive collecting in woods over a wide area should furnish quite interesting results. The form of the apical ventral valve is reasonably constant and is identical with those of specimens in B.M. Coll., but does not agree with Haupt's figure, which does not seem to the writer to be a very good one.

5. **P. minor** (Zett.).

Having the same widespread distribution as *exaltatus,* this species is represented by a greater number of specimens and is probably even more abundant. Although the ♀♀ are as active as the other members of the genus, on one occasion in a sandpit near Tingrith the ♂♂ were comparatively easy to catch, even with a net, as they seemed reluctant to abandon leisurely running for flight. Both sexes have been taken in most of the localities named below; but as this species is sometimes captured mixed with *pusillus,* great care has had to be taken in the separation of the ♀♀, because the form of the postscutellum and postnotum shows some variation in both, and a slight clear apical wing spot is sometimes present in *minor.* The absence of red colour on the third abdominal tergite and occasional darker markings on the two basal tergites in *minor* seem to the writer to be of some use in the separation of the two species. The following are localities on the Greensand: Woburn, Rowney Warren (Shefford), Heath and Reach, Rushmere Heath, Maulden, Clophill (Warren Wood and in a sandy field), and Tingrith. Elsewhere it has been taken on chalk downs at Shillington, Sharpenhoe, Dunstable (♀♀ on *Daucus*), and at Deadmansea Wood and Whipsnade Heath.

ACTIVE PERIOD. From the data obtained, this wasp has an active period longer than that of any other of the genus, with the possible exception of *femoralis,* extending over a period of at

least three months. 29th May, 1943, is the earliest record for both sexes, but frequent captures have been made in several localities in different years during the first half of June. The greatest number has been taken in August, the latest date for both sexes being 31st August. Separated into months the material was taken as follows: May, 5 ♂♂, 5 ♀♀; June, 7 ♂♂, 5 ♀♀; July, 2 ♂♂, 12 ♀♀; August, 4 ♂♂, 28 ♀♀. In one locality, Warren Wood, in 1942, single ♂♂ were taken on 7th and 27th June, ♀♀ on 19th June, 25th July and 16th August. Where the ♂♂ are taken at both ends of the flight period, it seems difficult to believe that we are dealing with a species which has only one generation in each year. On the other hand, if this can be taken as an indication of age, the number of specimens of either sex with even the slightest amount of fraying of the outer margins of the fore-wings is very small, these not being found exclusively amongst the later captures, which are just as fresh-looking as those taken at the end of May. As with *femoralis,* the remaining alternative is a greatly ' staggered ' emergence.

No data have been secured on the prey, and little else on the biology, with the following exception. A party of this wasp (5 ♀♀, 5 ♂♂ taken) was found in a state of great activity on a small vertical exposure of sand a few feet wide in a pasture near Woburn on 29.v.43. Emergence had evidently taken place quite recently, and two ♀♀ were seen excavating burrows at a terrific rate in the vertical sand face. Other ♀♀ were running about erratically in the immediate vicinity of the sandbank, the surrounding turf yielding no more. No spider prey could be found hung up anywhere near the burrows; but, what is more to the point, it would be extremely unlikely to find two Pompilids just returned from successful hunting expeditions at exactly the same time and in the same place. The inference is therefore that this species digs a burrow before hunting its prey, which is in agreement with the observations of Adlerz, quoted by Haupt (1927, p. 319), thus differing from most other Pompilidae. Other work on the Hymenoptera prevented the writer from making further time-consuming observations at the time.

FEMALES (48 specimens). Vary in length from 4·4—7·3 mm. (mean 5·9 mm.).

MALES (18 specimens). 4·4—5·8 mm.

6. **P. obtusiventris** Schiodte.

This species has been taken in comparatively small numbers at localities on or near the chalk escarpment on Beacon Hill, Shillington; Dunstable Downs; Galley Hill, Streatley; Sharpenhoe Hills and Whipsnade Heath. For ease of collecting, localities have been selected where the grass (*Festuca ovina*) is rabbit-browsed or otherwise short, and *Cirsium acaulis* is prevalent. No doubt it occurs anywhere on the chalk scarp-slope in the south of

the county, upon hillsides with a south aspect, but would be difficult to find where the grass is long. The ♀♀ show a partiality for the umbels of *Daucus*. Single ♀♀ have also been taken at the Greensand localities of Warren Wood and Tingrith.

The material available is not sufficient to give an accurate picture of its active period. A close watch on localities on the chalk downs has failed to produce any ♂♂ before the beginning of July, two having been taken with other Pompilids on 4th July, 1943. From July onwards the species is in full activity until September at least, the latest dates for captures being ♀♀ 6th September, ♂♂ 5th August. The single ♀ from Warren Wood was taken on the early date of 19th June. The active period probably extends therefore from late June to September.

This is a rather larger species than others of the *pusillus* group, the 14 ♀♀ taken in all ranging from 6·7—8·8 mm. (mean 7·6 mm.) in length. The amount of coloration on the legs is fairly constant, the apical half or two-thirds of the hind femora being bright red (easily visible to the naked eye): red or testaceous patches are also present on the extreme apices of the front and middle femora beneath and the front and hind tibiae.

7. **P. schiodtei** Haupt.

Represented by 2 ♂♂ from Warren Wood, taken 25th July and 1st August, 1942. Circumstances prevent further collecting in this locality for the present.

8. **P. cordivalvatus** Haupt.

This was first discovered in Bedfordshire on 23rd July, 1941, by Spooner (1942), the writer first finding it independently in Deadmansea Wood on 2nd August of the same year. Mr. Spooner's paper did not come to the writer's notice until August, 1943. In the interim period of two years a close search had been made and the species turned up in several other localities.

It is found in the same localities and in company with *femoralis,* being only a little less abundant than the latter. It has been taken freely in Deadmansea Wood, Kingswood and Marston Thrift, and more sparingly in Warren Wood, Clophill. Chicksands Great Wood is Spooner's locality. In all probability it occurs, with *femoralis,* in well-drained clearings in many of our boulder clay woods. Over a period of twelve years collecting in the county it has not turned up elsewhere, and is therefore almost certainly a woodland species. In habits it closely resembles *femoralis*; the ♀♀ of the two species, being of about the same size, are indistinguishable in the field and are frequently found mixed in a 'bag.' The ♂♂, however, show a greater tendency to avoid flight of more than a few inches above the ground, but dart extremely rapidly from the base of one plant to another. When frightened at an attempt at capture with a jar they will

even burrow an inch or so into the ground, and can only be secured by scooping out the soil, transferring to a net and picking it over piece by piece.

ACTIVE PERIOD. The flight period is only rather shorter than that of *femoralis,* but the period of maximum abundance is shifted more towards the end of July than in that species. Weekly observations in 1942 on the bank mentioned under *femoralis* gave the following data: 14th July, 3 ♂♂; 21st July, 4 ♂♂, 1 ♀; 26th July, 8 ♂♂; 2nd August, 9 ♂♂, 5 ♀♀; 9th August, 14 ♂♂, 7 ♀♀; 23rd August, 5 ♀♀. In 1943, a ♂ was seen on 23rd June in Kingswood; at Marston Thrift, on 13th June, none was seen, only *femoralis,* while on 29th July *cordivalvatus* was found in equal or greater numbers than *femoralis*. The writer's material was taken as follows (number of specimens):

			July				August		
	—7	8—14	15—21	22—28	29—4	5—11	12—18	19—25	26—
♂♂	2	14	4	14	15	15	1	–	–
♀♀	–	1	1	9	10	8	1	5	3

The species, therefore, is active from late June to September, the ♂♂ disappearing before the end of August, and has probably only one generation.

PREY: Warren Wood, 16.viii.42, and Marston Thrift, 29.vii.43: both immature *Clubiona* spp., probably *brevipes*.

FEMALES (37 specimens). The legs are black with reddish or testaceous markings, not visible to the naked eye, on the front and sometimes hind tibiae above and the apices of all the femora beneath, more especially the hind pairs. Length 5·1—8·1 mm.; mean 6·3 mm.

MALES (65 specimens). The tarsi, the whole of the tibiae and apex of the femora of the front legs are bright testaceous, easily visible to the naked eye: the same parts of the middle pair of legs are similarly coloured but not so brightly or so visibly. Length 3·9—6·1 mm.; mean 5·1 mm. (standard deviation ·53).

9. **P. pusillus** Schiodte.

In company with *obtusiventris* and species of *Pompilus,* this species is most often found, sometimes quite abundantly, on the short turf of the steep sides of chalk downs having a sunny aspect. Such situations are Sharpenhoe; Totternhoe Knolls; Galley Hill, Streatley; Dunstable Downs and several of the chalk hills at Pegsdon in the parish of Shillington. Elsewhere single ♀♀ have been taken in a sandblown field at Maulden on the Greensand and in Deadmansea Wood. The ♀♀ are often found on *Daucus*.

Active Period. There seems to be no doubt that this is one of the latest species of *Priocnemis* to appear and probably has a shorter flight period than any other. Apart from a ♀ taken on 14th July, the earliest date for both sexes in good numbers is 28th July, 1943 ; but August is the usual month for the capture of both ♂♂ and ♀♀. Females have been taken as late as 19th September.

Length. Females (18 specimens), 5·8—7·6 mm. (mean 6·5 mm.). Males (26 specimens), 4·8—6·1 mm. (mean 5·5 mm.).

Characters of Females of Species with an Apical Wing-Spot.

(*a*) POL: OOL. The distances were measured from the mid-points of the posterior ocelli in the manner of Spooner (1941), as this covers the whole width of the vertex, rather than according to the definition of Haupt (1927, p. 15), who made use of the distances *between* the ocelli and the ocelli and the compound eyes.

(*b*) Arrangement of ocelli. Haupt refers to the small triangles formed by the ocelli as obtuse-, right- or acute-angled, under several of the species. To check up the value of this for diagnostic purposes it is necessary to measure the distances between the mid-points of the anterior and posterior ocelli, which for brevity will be referred to as PAOL in this paper. Hence to adopt a preciseness of definition which was probably never intended originally, the ocelli will be arranged in an obtuse-, right- or acute-angled triangle if PAUL : POL is less than, equal to or greater than $\sqrt{2} \div 2 = \cdot 71$ respectively.

(*c*) In addition to certain quite definite equalitative differences in the form of the postnotum in the different species, the relative lengths, in the median line, of the postscutellum and postnotum are also of value in the separation of the species. The ratio is given as PS : PN.

The ranges of the determined ratios for the six species (including *minor*) are shown in the table :

Species	No. of spp.	POL : OOL	PAOL : POL	PS : PN
P. exaltatus ...	16	.84–1.03	.62–.75	.8–1.2 mode 1.0
P. femoralis ...	45	.66–.86 mean .75 S.D. .051	.74–.89	.9–1.25 mode 1.0
P. minor	49	.70–.90 mean .82 S.D. .046	.68–.86	1.2–2.0 mode 1.4
P. obtusiventris ...	13	.87–1.00	.65–.75	1.8–2.7
P. cordivalvatus ..	37	.70–.87 mean .79 S.D. .039	.71–.86	1.7–2.4 mode 2.0
P. pusillus ...	18	.79–.94	.70–.81	2.0–3.4

Discussion of Data. Apart from its smaller size, *femoralis* is, of course, readily separated from *exaltatus* by the less strongly sculptured propodeum, which has a more or less strongly impressed median dorsal line or furrow (as in some individuals of the smaller species), and by the much stronger subapical tooth of all the claws, which, viewed laterally, projects higher than the claw apex, and is placed nearer to the latter than in *exaltatus*. The data show, in addition, that POL : OOL is much less in *femoralis* than in *exaltatus*, and in so far as the limited data for the last species allow, the ranges for the two do not overlap. *P. exaltatus* has the ocelli arranged in an obtuse-angled triangle, *femoralis* has not.

The values for POL:OOL of the remaining four species are not of much use for diagnostic purposes, as the amount of overlapping is too great, with the possible exception of *obtusiventris*, which has a rather higher value for this ratio than the others. It is just possible, however, that POL:OOL may be of value in the separation of *cordivalvatus* from *gracilis*, a species which has not turned up in Bedfordshire so far; the writer therefore has not been able to make any measurements to confirm this. Haupt (1927: see definition above) gives the value of this ratio for *gracilis* as about ·5, Spooner (1932) as ·5—·67, *i.e.* both outside and below the range for *cordivalvatus*.

The amount of variation in PS:PN is greater than one would be led to suppose by the tables for the separation of the species that have been published. The first two species in the table, of course, are abundantly distinct from the others in this respect and have a genuine 1:1 ratio. *P. minor*, although variable, is also closer to the 1:1 ratio than the others, while the greatly reduced postnotum and overhanging postscutellum of *pusillus* contrast strongly with the strap-like regularity of form of the same parts in *cordivalvatus*, the species (apart from *gracilis*) which it most resembles. *P. obtusiventris*, in some specimens, has a rather diminished and, in the very centre at least, partly compressed postnotum, but the postscutellum does not overhang this part.

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COLLECTING DIPTERA ON THE NORFOLK BROADS.

By L. Parmenter, F.R.E.S.

In June, 1937, I visited Broadland in company with my friends Messrs. K. M. Guichard, E. B. Pinniger, G. H. Spinney and G. Waller. All of us were interested in the birds of this excellent area but in addition each of us specialised in collecting insects or plants. Whilst the others paid attention to Odonata, Lepidoptera, Coleoptera and Hymenoptera, Waller and I collected Diptera. I must, however, thank the others for several additions to my collection.

We had hired a small launch at Oulton Broad and found it an ideal home for collecting purposes. On the afternoon of the 12th we left Oulton Broad and by evening had reached Reedham, where we moored by a muddy area of *Juncus*. Sweeping this area before breakfast the next morning, I took my first specimens. After breakfast we paid a visit to the River Chet and collected along the river banks and adjoining fields. The next day, whilst the engine was being repaired, we visited the marshy fields of thistles and *Juncus* near Langley and examined the willows overhanging the ditches. We spent most of the 15th in moving to Horsey. During a halt for drinking water at Stokesby, and again at Potter Heighams for provisions, nets were in use for a few minutes. The next day, besides collecting in the vicinity of Horsey Mere, we visited the coastal sand hills and gathered from the hedgerows on the way. On the 17th, between morning showers, more captures were made at Horsey, but by evening we had visited Hickling and then on to South Walsham. The 18th was a day of heavy showers and we moved on to Wroxham. The next day Mr. Pinniger joined us and we proceeded up the river to Coltishall, collecting along the river edge and in the adjacent fields, including some bracken and a visit to a field on chalk. Mr. Waller had to leave us on the 20th. A little collecting was done along the river bank near Wroxham, but it turned to rain. The 21st, though at times cloudy, was our first really hot day. It was marked by our first sight of the swallow-tailed butterfly and a heavy attack on us by two species of *Tabanus*. We collected near Hoveton Little Broad and Ranworth Broad and at Ludham. Next day we visited Barton Broad and collected in the fields by the river and returned to Horsey. We made another trip to the coast on the 23rd, returning *via* Winterton with many specimens. Next day we netted a few more specimens before leaving Horsey for Reedham. The following day the River Chet and Langley areas were again visited, and then back to Oulton Broad.

The following list of species consists of those so far identified from my collection. The localities are indicated :—

B. near Barton Broad.	Lu. near Ludham.
Ch. River Chet.	P. Potter Heigham.
Col. near Coltishall.	R. Reedham.
H. near Horsey.	Ran. near Ranworth Broad.
Hov. near Hoveton Little Broad.	S. Stokesby.
La. near Langley.	W. near Wroxham.

MYCETOPHILIDAE.

Leia fascipennis Mg. det. F.W.E. : R. *Macrocera stigma* Curt. det. F.W.E. : Col.

RHYPHIDAE.

Rhyphus punctatus Mg. : H. ; La.

CULICIDAE.

Aedes cinereus Mg. : H. *A. detritus* Hal. : H. *Taeniorhynchus richardii* Fic. : H.

PTYCHOPTERIDAE.

Ptychoptera contaminata L.: Ch. ; La. *P. scutellaris* Mg.: Col.

TIPULIDAE.

Limnophila fulvonervosa Schum. det F.W.E. : W. *Nephrotoma flavescens* L. : H. ; R. *Tipula fascipennis* Mg. : La. *T. lunata* L. : S. *T. maxima* Pod. : La. *T. nigra* L. : Ch. *T. oleracea* L.: H. *T. pruinosa* Wied.: Ch. *T. scripta* Mg.: H.

STRATIOMYIDAE.

Beris vallata Forster : B. ; Col. ; H. ; La. ; P. ; W. *Chloromyia formosa* Scop. : B. ; Col. ; La. *Microchrysa cyaneiventris* Ztt. : La. *M. flavicornis* Mg. : H. ; La. ; W. *M. polita* L. : Lu. ; P. *Nemotelus nigrinus* Fln. : Ch. *N. notatus* Ztt. : H. ; Ch. *N. pantherinus* L. : Col. *N. uliginosus* L. : Ch. ; R. *Odontomyia ornata* Mg.: B. *O. tigrina* F.: Hov. *O. viridula* F.: B. ; Ch. *Oxycera pulchella* Mg. : La. *O. tenuicornis* Macq. : Col. *O. trilineata* F. : Col., in colln. G.W. *Sargus iridatus* Scop. : B. ; La. ; Ran. *Stratiomys furcata* F. : Ran.

RHAGIONIDAE.

Chrysopilus cristatus F.: Col. ; H. ; La. ; P. *Rhagio lineola* F.: H. ; La. *R. scolopacea* L. : Col. ; La. *R. tringaria* L. : H.

TABANIDAE.

Chrysops quadrata Mg. : H. ; La. *C. relicta* Mg. : Ch. ; H. *Haematapota crassicornis* Wahlbg. : Ch. ; Ran. *H. pluvialis* L. : Ch. ; La. ; Lu. *Tabanus bisignatus* Jaen. : B. ; Ran. *T. tropicus* Mg. : B. ; Ran.

ASILIDAE.

Dioctria Baumhaueri Mg. : La. *D. rufipes* Mg. : H. ; La. *Dysmachus trigonus* Mg. : Col. ; H. *Philonicus albiceps* Mg. : H.

THEREVIDAE.

Thereva annulata F.: H. *T. nobilitata* F.: Col.; H.

EMPIDIDAE.

Empis livida L.: Ch.; Col.; La. *E. stercorea* L.: H.; La.

DOLICHOPODIDAE.

Argyra argentina Mg.: H. *A. diaphana* F.: H. *A. leucocephala* Mg.: H.; La. *Campsicnemus curvipes* Fln.; H. *C. loripes* Hal.: H. *C. scambus* Fln.: H. *Chrysotus neglectus* Wied.: B.; Col.; H. *Dolichopus brevipennis* Mg.: Ch.; R. *D. claviger* Stan.: Col. *D. campestris* Mg.: Lu. *D. lepidus* Staeg.: H. *D. nubilus* Mg.: B.; Ch.; H.; R. *D. pennatus* Mg.: Col. *D. plumipes* Scop.: Col.; H.; P. *D. popularis* Wied.: Ch.; H.; La.; R. *D. simplex* Mg.: H.; La.; R. *D. ungulatus* L.: Col.; H.; Lu.; S. *D. urbanus* Mg.: Col. *D. vitripennis* Mg.: H. *D. Wahlbergi* Ztt.: P. *Gymnopternus aerosus* Fln.: Col.; H.; La.; Lu.; W. *G. celer* Mg.: La. *G. cupreus* Fln.: H.; La. *Hercostomus nigripennis* Fln.: H. *Hygroceleuthus diadema* Hal.: H. *H. latipennis* Fln.: Ch.; R. *Leucostola vestita* Wied.: Col. *Poecilobothrus nobilitatus* L.: H. *Psilopus Wiedemanni* Fln.: Ch.; Col. *Sympycnus desoutteri* Par.: R. *Xanthochlorus ornatus* Hal.: H.; W.

LONCHOPTERIDAE.

Lonchoptera lutea Pz.: Ch.

PIPUNCULIDAE.

Pipunculus littoralis Beck.: H. *P. Thomsoni* Beck.: H. *Verralia pilosia* Zt.: B.

SYRPHIDAE.

Baccha obscuripennis Mg.: B. *Catabomba pyrastri* L.: H. *Chilosia albitarsis* Mg.: B.; Col. *C. variabilis* Pz.: B. *Chrysogaster chalybeata* Mg.: La.; Lu. *C. hirtella* Lw.: B.; Col.; H.; Ran. *Chrysotoxum cautum* Har.: B. *C. festivum* L.: Col. *C. veralli* Collin: Col. *Eristalis arbustorum* L.: Col.; La.; R. *E. horticola* Deg.: Ch.; Ran. *E. intricarius* L.: D.; Ch.; La. *E. nemorum* L.: B.; Ch.; H.; La.; R. *E. pertinax* Scop.: H.; La. *E. sepulchralis* F.: Col.; La.; R. *E. tenax* L.: Col.; H.; La.; R. *Helophilus frutetorum* F.: B.; H.; Hov. *H. hybridus* Lw.: La.; R. *H. lineatus* F.: B.; H. *H. pendulus* L.: B.; Col.; H.; La.; R. *H. transfugus* L.: H. *H. trivitatus* F.: La. *H. versicolor* F.: B.; H.; Lu.; Hov. *Leucozona leucorum* L.: S. *Liogaster metallina* F.: Ch. *Melanostoma mellinum* L.: Col.; H.; R. *Myiatropa florea* L.: Col. *Neoascia dispar* Mg.: H. *N. podagrica* F.: H. *Orthoneura nobilis* Fln.: Hov. *Paragus tibialis* Fln.: H. *Pipizella flavitarsis* Mg.: H. *P. virens* F.: B. *Platychirus augustatus* Zt.: Col.; H.; La. *P. clypeatus* Mg.: Ch.; H.; La.; Lu.; P. *P. fulviventris* Macq.: H.; Lu.; P.; R. *P. immarginatus* Zt.:

H. *P. manicatus* Mg. : H. *P. peltatus* Mg. : Ch. ; Col. ; H. ; La. ; R. *Pyrophaena granditarsa* Forster : B. ; Ch. ; Col. ; H. ; La. ; Lu. ; R. *P. rosarum* F. : B. ; Col. ; H. *Rhingia campestris* Mg. : Col. ; La. ; R. *Syritta pipiens* L. : B. ; H. ; La. R. *Syrphus albostriatus* F. : Col. *S. balteatus* Deg. : H. *S. bifasciatus* F. : Col. *S. corollae* F. : H. ; Lu. *S. torvus* O.S. : La. *Tropidia scita* Har. : B. ; Ch. ; Col. ; H. ; Hov. ; La. *Volucella bombylans* L., var. *bombylans* : Col. ; H. ; La. var. *plumata* : Col. ; H. *Xylota abiens* Wied. : Hov. *X. segnis* L. : H.

CONOPIDAE.

Sicus ferrugineus L. : H.

TACHINIDAE.

Bucentes cristata F. : H. *Calliphora erythrocephala* Mg. : H. ; La. *Cynomyia mortuorum* L.: Ch. *Lucilia silvarum* Mg.: Ch. *Metopia leucocephala* Rossi : H. *Pollenia rudis* F. : B. *Sarcophaga carnaria* L. : Ran. *S. scoparia* Pand. det. C.J.W. : H. *S. sinuata* Mg. : La. *Thelaira nigripes* F. : La.

MUSCIDAE.

Graphomyia maculata Scop. : La. *G. picta* Zt. : H. *Mesembrina meridiana* L. : B. ; H. ; La. *Morellia aenescens* R.D. : B. ; Col. ; H. ; La. *M. hortorum* Fln. : Ch. ; Col. ; La. *Musca corvina* F.: B. ; Col. ; H. ; La. ; R. *Pollietes lardaria* L. : B. ; La.

ANTHOMYIDAE.

Coenosia tigrina F. : Col. ; La. *Fannia hamata* Macq. : Col. *Helina lucorum* Fln : Col. *Hydrophoria conica* Wied. : Col. ; H. *Hydrotaea dentipes* F. : H. ; La. *H. irritans* Fln. : La. *Mydaea urbana* Mg. : H. *Phaonia basalis* Zt. : H. *P. incana* Wied. : Ch. ; Col. ; H. ; La. *P. pallida* F. : Col. *P. perdita* Mg. : Ch. ; La. *P. signata* Mg. : Col. *Spanochaeta dorsalis* v. Ross. : H. ; W. *Schoenomyza litorella* Fln. : H.

CORDYLURIDAE.

Clidogastra nigrita Fln. : W. *Cordylura ciliata* Mg. : H. *C. pubera* F. : Col. ; La. *C. umbrosa* Lw. : H. *Leptopa filiformis* Zett. det. J.E.C. : Col. *Norellia spinimana* Fln. : Col. *Parallelomma albipes* Fln. : Col. ; H. ; La. *Scatophaga litorea* Fln. : Ch. *S. lutaria* F. : H. *S. squalida* Mg. : La. *S. stercoraria* L. : B. ; Col. ; H. ; La. ; R. *S. suilla* F. : La.

ULIDIIDAE.

Seoptera vibrans L. : B. ; La.

ORTALIDIAE.

Melieria crassipennis F. : Col. ; Lu. ; W. *M. picta* Mg. : Ch.

TRYPETIDAE.

Orellia ruficauda F.: Col. ; W. *Tephritis bardanae* Schrk.: W. *Vidalia cornuta* Scop. : B. *Xyphosia miliaria* Schrk. : B. ; H.

LONCHAEIDAE.

Palloptera gangraenosa Pz. : La. *P. ustulata* Fln. : La.

LAUXANIDAE.

Lauxania aenea Fln. : H. ; La. *Minettia fasciata* Fln. : H. *M. inusta* Mg. : Col. *M. lupulina* F. : Col. *M. plumicornis* Fln. : H. *Paralauxania albiceps* Fln. : H. *Peplomyza litura* Mg. [*wiedmanni* Lw.] : Col. *Sapromyza decipiens* Lw. det. J.E.C. : Col. ; H. *S. notata* Fln. : B.

MICROPEZIDAE.

Calobata cibaria L. : P. *C. cothurnata* Pz. : W.

SEPSIDAE.

Nemapoda cylindrica F. : Hov. *Pandora scutellaris* Fln. : Ch. *Themira lucida* Staeg. : Ch. ; H. *T. superba* Hal. det. J.E.C. : H.

PSILIDAE.

Loxocera aristata Pz. : Col. ; H.

SCIOMYZIDAE.

Elgiva rufa Pz. : Lu. *Limnia marginata* F. : Col. *L. obliterata* F. : Col. *L. rufifrons* F. : Col. *L. unguicornis* Scop. : Col. ; H. *Sepedon sphegeus* F. : H. *Tetanocera elata* F. : B. ; Ch. ; Col. ; La. *T. robusta* Lw. : B. ; H. ; La.

OPOMYZIDAE.

Balioptera [*Geomyza*] *combinata* L. : H. *Opomyza germinationis* L. : Ch. ; H.

DROSOPHILIDAE.

Camilla glabra Fln. det. J.E.C. : H.

BORBORIDAE.

Borborus equinus Mg. : H. ; P. *B. similis* Coll. : Col. ; H. *B. stercoraria* Mg. : Ch. *Sphaerocera subsultans* L. : La.

EPHYDRIDAE.

Ephydra riparia Fln. : H. *Notiphila cinerea* Fln. : Ch. ; P. *N. riparia* Mg. : H. *Scatella stagnalis* Fln. : H.

CHLOROPIDAE.

Shlorops pumilionis Bjerk. [*taeniopus* Mg.] : H. *Lipara lucens* Mg. : B. ; Ran. *Meromyza pratorum* Mg. : H.

AGROMYZIDAE.

Dizygomyza capitata Ztt. : La.

I am very grateful to the late Dr. F. W. Edwards and to Messrs. J. E. Collin and C. J. Wainwright for assistance in determining several of the above as shewn in the text.

Some records of the insects seen and taken have already been published :—

Aculeates on the Norfolk Coast. K. M. Guichard. 1938. *Lond. Nat.*, **1937**: 71-2.

Notes on Dragonflies, 1937. E. B. Pinniger. 1938. *Lond. Nat.*, **1937**: 77-9.
A Dragonfly with Dipterous Prey. L. Parmenter. 1937. *Proc. R. ent. Soc., Lond.*, **12**: 138.
A Cannibal Asilid. L. Parmenter. 1937. *Proc. R. ent. Soc., Lond.*, **12**: 138.
Further Records of Predacious Flies and their Prey. L. Parmenter. 1941. *Ent. mon. Mag.*, **77**: 154-5.

INSECT VISITORS TO THE FLOWERS OF SEA ASTER, *ASTER TRIPOLIUM* L.

By L. Parmenter, F.R.E.S.

At the western end of the estuary at Hayle, Cornwall, there is a small area of sea asters. The following insects were visiting the flowers on 22nd and 23rd August, 1943 :—

Diptera.

Muscidae. **Orthellia* [*Cryptolucilia*] *caesarion* Mg., 1 ♀.
Syrphidae. **Eristalis abusivus* Coll., 1 ♀. *E. tenax* L., 7 ♂♂, 8♀♀.

Hymenoptera.

Apidae. *Apis mellifera* L., 4.

Lepidoptera.

Nymphalidae. **Aglais urticae* L., 1. **Vanessa atalanta* L., 1.
Pieridae. **Pieris brassicae L.*, 1.

Those marked * are additional to the species listed as visitors to this plant in Clapham A. R., Pearsall W. H., and Richards P. W.: 1942, *J. of Ecol.*, **30**: 392-3.

HOUSE SPARROW TRYING TO CATCH *PIERIS BRASSICAE* (Linn.) (Lep.).

By F. H. Day, F.R.E.S.

I sometimes see sparrows chasing and catching white butterflies, but one day recently (May 8th, 1944), while standing near the window in my garden shed watching a *Pieris brassicae* which had lately emerged from pupa, and was fluttering on the inside of the window, a sparrow outside on the lawn flew up to the window, hovering there, and endeavouring to seize the butterfly through the glass. I could hear plainly the sound of its beak tapping on the glass. The beak was wide open and

there was no doubt of the bird's intention to catch the butterfly, but it desisted in its efforts when it caught sight of me, not more than a foot away, and flew back on to the lawn. A minute later it returned and renewed its attack, a second sparrow joining it, without however being so bold as the first one. Eventually both retired, of course unsuccessful.

A POSSIBLE DERIVATION OF THE NAME '*AESHNA*' Fabr. (Odonata).

By Lt.-Col. F. C. Fraser, M.D., F.R.E.S.

Several writers have made attempts to trace the derivation of the name 'AESHNA' Fabricius, emended in Illiger to 'AESCHNA,' but none can be said to be entirely convincing. The following is yet another attempt based on the possibility of the name being an anagram, which was, and still is, a not uncommon method for constructing new names. It is also based on a well-founded belief that Fabricius was a devoted reader of Dean Swift and that his employment of the name 'VANESSA' in Lepidoptera was adopted from Swift's diminutive for his girl friend, Miss Van Esther Homrih. Thus it is not at all improbable that, having employed one name from this source, he might be tempted to construct another on the lines of an anagram. Taking therefore the diminutive and adding the initial of the lady's surname, we get the remarkable combination, 'VAN ESSA H,' which is found to contain all the letters, neither more nor less, that are contained in the name 'AESHNA,' the sole exception being the double 'ss,' which may be used in the singular or in its euphonic sense. The 'v' of course will be objected to, and I must confess that it caused me quite a lot of deep thinking until I suddenly realised that the 'AE' was a dipthong and that the 'v' was included between the two letters. The late Mr. Kenneth Morton was inclined to ridicule this possible source of the name, but the fact remains that the chances of such an astounding coincidence occurring must be measured as one in millions ! Mr. Morton wrote : 'You might just as well say that because *Chrysophanus artaxerxes* Fabr. (*L. astrarche*) was discovered on Arthur's Seat, Fabricius constructed an anagram on this name.' In a later letter, he wrote : 'I have just noticed that the name "ARTAXERXES" has the ring in it of "ARTHUR'S SEAT," and when one remembers that a foreigner would pronounce the latter as "ARTER'S SEAT," a further emphasis is put on this point — not that I think for one moment that this had anything to do with the derivation of the word "ARTAXERXES." In any case I think that you have the laugh on me ! '

VOLUCELLA ZONARIA Poda, ♀ (Dipt., Syrphidae) IN KENT.

By Gurth Waller.

On the 11th August, 1943, I captured a female of *Volucella zonaria* Poda, on an office window in the Sandgate Road, Folkestone, Kent. Mr. L. Parmenter, F.R.E.S., has examined and compared the specimen with one from Malaucène, Vaucluse, France, and confirms my identification. I had previously seen this conspicuous Syrphid twice before in a part of the Leas near the Pleasure Gardens Theatre entrance and close to where my capture was made. The first occasion was on the 2nd October, 1941, on ivy blossom, the second on the 22nd June, 1943. It is perhaps significant that in this part of the Leas there has been for several years an extensive colony of *Vespa vulgaris* L. in the cliff face, and I believe *zonaria* is known to be an inquiline in the nest of this wasp. Its appearance in 1941 and 1943 in exactly the same place possibly indicates that it is breeding here. Previous records of this Dipteron may be found in *J. Soc. Brit. Ent.*, **1** (8): 210-211, and **2** (3): 121.

RECORDS OF THE STRIPED HAWK-MOTH (*Celerio lineata livornica* Esp.) SEEN OR BRED IN THE BRITISH ISLES IN 1943.

By Capt. T. Dannreuther, R.N., F.R.E.S.,
Hon. Sec., Insect Immigration Committee, S.E.U.S.S.

The grand total of all the known appearances of the striped hawk-moth recorded since 1824 in the British Isles is tabulated up to 1942 at 698, a figure almost reached again since March, 1943. The previous maximum abundance was recorded in 1931 at 142 moths seen and 28 larvae taken. Herewith are details of the 1943 records collected by the Insect Immigration Committee.

Mar. 28, at Devizes, a ♂ captured on grass by a boy, D. Knapman, and identified by Baron C. de Worms (*Entom.*, **76**: 259).

May 23, at Timoleague, Co. Cork, first captured at dusk over valerian. Up to June 20 the total counted was 14, of which 4 ♂♂ and 2 ♀♀ were taken by Mrs. G. E. Lucas and sexed by Lt.-Col. C. Donovan.

May 27 to June 28, at St. Mawes, S. Cornwall, in nightly counts at dusk over valerian, Guy T. Adkin recorded 208, capturing 23 ♂♂ and 9 ♀♀. On May 29 there was a N.E. migration of *V. cardui* and *P. gamma*; and *H. peltigera* were noted in association with *C. l. livornica* when feeding at flowers.

May 28 to June 9, a few miles north of Boscastle, N. Cornwall, at dusk over valerian about 51 were seen by Capt. S. H. Kershaw, with *H. scutosa* and *M. stellatarum* also present. 7 ♂♂ and 2 ♀♀ captured; but many more ♀♀ could have been taken (*Entom.*, **77**: 37).

May 28, at Torquay, a pair taken over valerian by M. Locke.

May 29, at Wrangton, E. of Plymouth, one seen over campion flowers in the evening by H. G. Hurrell.

May 29, in the New Forest at dusk, one captured feeding on honeysuckle by C. J. Perrens.

May 29, at Weston-super-Mare, a ♂ taken over valerian at dusk by C. S. H. Blathwayt.

May 29 to June 15, at Llangranog, E. of Cardigan, about 15 seen over valerian at dusk, when 10 *H. peltigera* and some *M. stellatarum* were also present. Up to June 10, R. Fairclough captured 8 ♂♂ (*A.E.S. Bull.*, **59**: 58).

May 30 to June 9, at Clevedon, Somerset, certainly a dozen were seen by J. F. and H. W. Bird, of which a ♂ and 4 ♀♀ were captured (per C. G. Clutterbuck).

May 30 to June 13, at Bodenham, near Salisbury, a dozen seen at dusk over valernian and honeysuckle. Lt.-Col. W. G. B. Hawley took 6 ♂♂ and 4 ♀♀, and C. R. Pitman another ♀. 70 ova distributed for rearing experiments hatched about June 20 (*Entom.*, **76**: 171).

May 30, at Helwick Head, Co. Waterford, a ♂ was taken in the morning by W. H. Poole (per L. Hugh Newman).

May 30 to June 6, at Helen's Bay, S. shore of Belfast Lough, in the evenings over white rhododendron blooms, about 15 seen by A. F. O'Farrell, of which 4 ♂♂ and 5 ♀♀ were taken. One had already deposited ova (*Irish Nat. Jl.*, **8** (4): 113).,

May 31, at Glengarriff, Co. Cork, after resting in long grass at 2 p.m. a ♀ was captured by J. E. Flynn. It died on June 11 after depositing 66 infertile ova.

May 31 to June 7, at Charlestown in St. Austell Bay, Cornwall, about 16 were found at rest by schoolboys on the cliffs. 4 ♂♂ and a ♀ were either captured or found dead by W. Stephen-Jones and G. A. F. Rands (*Entom.*, **77**: 33).

End of May to mid-June, at Moreton Valence, Glos., about 40 seen at dusk. Of the captures, 8 ♂♂ were released but 2 ♀♀

retained for ova by M. L. Ridgeway. 45 larvae, fed on white bedstraw, died 21 days after hatching (*Field,* Oct. 2).

May 31 to June 10, at Tollard Royal, near Salisbury, a ♂ was captured on grass (Miss Vere Temple) and a worn ♀ released by Mr. Weeks (*Entom.* **76**: 146 and 171).

May 31, near Trowbridge, Wilts, a ♀ brought to J. W. Weddell laid eggs but none reared (C. de Worms).

May 31, at Hurn Common, near Bournemouth, a ♂ was taken resting on heather by G. Brasnett (*Entom.,* **76**: 189).

May 31, at Palling, N. of Great Yarmouth, a dead ♀ was picked up by a schoolboy, F. Clements, and sent by Miss E. Chapman to the Castle Museum, Norwich, for identification (E. A. Ellis).

May 31 to June 10, in East Kent, about half a dozen were seen at dusk on red valerian amongst scores of *P. gamma*. Only one, a worn ♂, was taken by Maj. C. G. Lipscomb (*Entom.,* **76**: 172).

June 1, at York, a ♂ was taken resting on plants by A. Smith (per B. A. Cooper).

June 2 and 5, at Rodborough Fort, near Stroud, Glos., a ♂ captured on valerian at dusk and another seen later by Fleet-Payr. T. Bainbrigge Fletcher.

June 2 and 5, in Beaudesert Park, Nailsworth, Glos., 4 seen at dusk on valerian and honeysuckle. A pair were taken by A. Richardson. On June 6 the ♀ deposited 66 ova and bred out with emergences, Sept. 27 to Dec. 5 (*q.v.*).

June 3, 4 and 9, at Salisbury, a ♂ captured on 9th out of 3 seen by Baron C. de Worms. A fourth ♂, identified by him, was taken on June 6 at W. Harnham by Miss Gummer.

June 3, at Huish, N. Devon, a ♀ was found on the Old Rectory lawn by Mrs. A. Leverton. It was posted alive to Derbyshire and identified by G. Hanson (*Entom.,* **76**: 171).

June 3, at Aspley Heath, Bedfordshire, in the afternoon a ♀ was found resting in a sandpit by a schoolboy, I. Turner-Jones (per Col. S. H. Kershaw).

June 3, at Tonbridge, Kent, a ♀, resting after oviposition, was found in the morning by a dustman (P. Featherstone) (*Entom.,* **76**: 189).

June 4, at Rathgar, Dublin, a ♀ was taken by T. H. Mason in Kenilworth Square and presented to Belfast Museum (*Irish Nat. Jl.,* **8** (4): 113).

June 5 to 13, 17 and 18, at Maidencombe, near Torquay, in all about 44 seen at dusk, mostly on June 8, F. H. Lees captured 10 ♂♂ and 8 ♀♀. Six were very fresh but others worn. 201 ova were obtained and bred out, Aug. 24 to Sept. 17 (*q.v.* below) (*Entom.,* **76**: 170).

June 4 to 13, at Teignmouth, nine counted and others heard at dusk feeding singly over valerian together with half a dozen *H. peltigera.* 2 ♂♂ and 2 ♀♀ were taken and a fifth reported captured in the neighbourhood (J. H. T. Hadley).

June 5, at Langley Mill, E. Derbyshire, a ♂ was captured at dusk over rhododendron blooms by J. W. O. Holmes (*Entom.*, **76**: 171).

June 5, at Northwich, Cheshire, a ♂ in good condition was taken at rest under a rhubarb leaf in day-time by H. Driver (Hon. Sec., Lincs. & Ches. Entom. Soc.).

June 6, at Griffithstown, Monmouthshire, a ♂ was caught indoors in the evening by Miss M. A. Briggs (per L. Hugh Newman).

June 6, at Onchan in the Isle of Man, a ♀ was taken on a lawn in the afternoon after attack by a sparrow and sent by G. J. H. Neely to Manx Museum (last record there dated 1899). 50 ova laid never hatched (W. S. Cowin). (*Entom.*, **76**: 207; *Brit. Birds*, Oct., 1943: 99).

June 6, at St. Budeaux, Plymouth, a ♀ taken by Miss M. Govier was identified alive on June 11 by O. G. Watkins. 12 larvae were hatched out from ova deposited but died before second moult.

June 6, at Prawle, S. Devon, a ♀ captured by G. R. S. Willson died on June 11 after depositing 72 ova, of which 48 hatched but only two pupated. There was an emergence on Oct. 12 (*q.v.*).

June 6, at Axminster, S.E. Devon, a ♀ was captured at dusk over rhododendron blooms by R. J. Sherlock. No ova. (L. Hugh Newman).

June 6, at Liphook, Hants, a ♂ was found drowsy at 3 p.m. on the Golf Course by a schoolboy, P. R. Wood, and identified by R. J. Sherlock (*Times*, June 15).

June 7, at Ravenhill Park, S. of Belfast Lough, a ♀ captured by W. J. Holden in the evening was presented to Belfast Municipal Museum (*Irish Nat. Jl.*, **8** (4): 113).

June 8, 9, 16 and 21, at Frome Somerset, 1 ♂ and 3 ♀♀ captured singly at dusk on valerian, honeysuckle and red campion by G. H. W. Cruttwell. All specimens worn (*Entom.*, **76**: 171).

June 8, at Bexley, Kent, a very fine ♀ was taken at dusk over honeysuckle by a boy, L. E. Dale (per L. Hugh Newman) (*Field*, Sept. 4).

June 9, at Formby, Lancs., one seen over rhododendron by G. de C. Fraser (C. de Worms).

June 9, near Manchester, one reported taken in the *Manchester Guardian*. No details given (H. Driver).

June 9, at Grange-over-Sands, Lancs., a worn ♂ taken at dusk by Dr. R. C. Lowther (*Entom.*, **76**: 190).

June 10, at Dorchester, a ♀ found resting in a field of roots by H. G. Wood Homer (*Field, Sept.* 11: 272).

June 11, at Three Mile Cross, S. of Reading, a faded ♀ found resting in early morning on a lawn by Miss B. Charles and identified by Dr. O. A. Beadle. (Last Reading record in 1870.)

June 11, at Dunster, W. Somerset, one taken feeding at dusk over valerian by C. J. Perrens (per C. S. H. Blathwayt).

June 12, at Paignton, Devon, at least 3 seen in the evening, a worn ♀ taken by P. P. Milman (per F. H. Lees).

June 12, at Calenick, near Truro, 2 seen at dusk over valerian by Col. H. Carey-Morgan (*Entom.*, **77**: 190).

June 16, at Ringwood, Hants, a ♀ in fair condition found resting on a wooden shed by N. H. Moody in the afternoon (D. Watson).

June 17, at Maidenhead, Berks, a ♀ found at rest on a shop window by P. N. Crow (*Entom.*, **76**: 190).

June 22, at Cheltenham, Glos., a worn ♀ found settled on a rain-water pipe at Dean Close School by E. P. Tubbs (Dr. O. H. Wild).

June, 'one seen by a member of the Wiltshire Education Committee' reported in the *Spectator*, Aug. 6: 130. No details given.

June 23 to 26, at Littleham, near Exmouth, about 3 seen singly at dusk over *Centranthus* by a brother of H. M. Edelsten.

June 24, at Maidencombe, near Torquay, a worn ♂ was taken and released by Frank H. Lees.

June 28, at Clyst Hydon, N.E. of Exeter, a ♂ in good condition was found in a flower garden by E. S. Morphew (*Field*, Sept. 11).

July 2, at Wembury, near Plymouth, a ♂ taken on Warren Point at red valerian by F. T. Williams (per F. W. Jeffery).

C. l. livornica Larvae found and Specimens bred in 1943.

July 2, at Bournemouth, a larva found on dock by R. Wallace reached last instar on July 16. A fine ♀ emerged at end of Oct. (Lt.-Col. F. C. Fraser).

July 5, at St. Budeaux, Plymouth, a larva found on dock by Miss M. Govier produced a cripple on July 29 (F. W. Jeffery).

July 6, at Sherborne, Dorset, 7 larvae were found on dock in an open field, two of them nearly full grown (A. H. H. Harbottle) (*Entom.*, **76**: 172).

July 12, at St. Budeaux, Devon, another larva was taken on dock by Miss M. Govier. It pupated but did not emerge (O. G. Watkins).

July 19, at Bloxworth, Dorset, 3 larvae taken on dock from which a ♂ emerged on Aug. 29 and a ♀ on Sept. 11 (W. L. Rudland).

July 21, at St. Mawes, Cornwall, 5 larvae found feeding on buckwheat shoots in a garden and reared thereon by G. T. Adkin. All pupated but only 2 ♂♂ emerged on Sept. 5 and 8 (*Entom.*, **77**: 36).

July 21, at Aber, Caernarvonshire, 4 larvae found in a strawberry field by J. Thomas. A ♂ emerged on Sept. 1 (H. M. Edelsten).

July 28, at Peverell, Plymouth, a larva found on dock died when full grown on Aug. 11 (F. W. Jeffery).

July 28, at Hillmorton, Rugby, a larva found and fed on lettuce by W. Foddy. A perfect ♀ emerged on Oct. 7 but it was dead (*Rugby Advertiser*, Oct. 22).

July 28, at Charlestown, St. Austell, S.E. Cornwall, a full-fed larva was found on dock; it pupated on Aug. 3. In Dec. a hole in the pupa case indicated that parasites had escaped unobserved (W. Stephen-Jones) (*Entom.*, **76**: 238; **77**: 38).

July 31, at Cranleigh, Surrey, a larva found and fed on dock was forced by Dr. B. D. Kettlewell and a ♂ emerged on Aug. 31 (*Ent. Rec.*, **55** (11)).

In July, at Watersfield, near Pulborough, Sussex, a larva was shown alive to A. J. C. Wightman, but it died as a larva.

Aug. 5, at Balbriggan, N. of Dublin, a larva found in a field of oats, pupated on Aug. 12, but died during the winter (A. W. Stelfox).

Aug. 10. to Oct. 5, 98 ova, obtained mostly from captures in early July in Wiltshire and distributed by Lt.-Col. W. G. B. Hawley (*q.v.* above) to members of the South London Entom. and N.H. Society. They hatched out about June 20, under natural conditions and 54 moths were bred out—those sexed being 12 ♂♂ and 20 ♀♀. The experiments were carried out by Lt.-Col. Hawley, F. Stanley Smith, Eng.-Capt. S. T. Stidston, S. Wakely, Dr. G. V. Bull, R. J. Burton, F. D. Coote, J. M. Jacques and S. W. C. Williams. The earliest emergences, on Aug. 10 and 15, were released in Hyde Park. (Report from Hon. Sec., S. Lond. & N.H. Entom. Soc.)

Aug. 24 to Sept. 17, at Maidencombe, near Torquay, from 201 ova laid locally between June 5 and 13, F. H. Lees, the captor, reared 6 ♂♂ and 3 ♀♀. There were four emergences on Aug. 24, three on 26th and one each on 29th and Sept. 17.

Aug. 25, at Reading, 2 larvae found at Grazely late in June and fed on lettuce, pupated on July 28. A ♀ emerged on Aug. 25 (C. Runge).

Sept. 1, at St. Budeaux, Plymouth, a larva brought to Miss M. Govier pupated immediately. F. W. Jeffery reported it still alive on Feb. 22, and from it, on Mar. 31, 1944, there emerged a single parasite fly identified at the British Museum (N.H.) by G. E. J. Nixon as the first recorded *Ichneumon laminatorius* Fab. ex *livornica*. (*Celerio galii* has been noted as a host for this parasite in Great Britain; it commonly attacks *D. elpenor*).

Sept. 4 and Oct. 2. From ova distributed by F. H. Lees, obtained at Maidencombe, Devon, between June 5 and 13, the 40 small larvae received by A. J. C. Wightman at Pulborough, Sussex, produced a ♀ on Sept. 4 and a ♂ on Oct. 2.

Sept. 27 to Dec. 5, Austin Richardson, the captor (*q.v.* above), from 66 ova collected on June 6 at Nailsworth, Glos., reared on bedstraw and *Antirrhinum* at 70° F., sprayed daily, obtained 7 ♂♂ and 8 ♀♀, the last emergences being one on Nov. 15 and two on Dec. 5.

Oct. 12. Ova laid on June 6 at Prawle, Devon, distributed by G. R. S. Willson (*q.v.* above) and sent to the Bexley Butterfly Farm in Kent, produced a ♀ reared by L. Hugh Newman.

Oct. 27. A larva taken near Dartmouth pupated on Oct. 27 but died in Apr. before emergence (G. R. S. Willson).

In September at Picket Post, near Ringwood, Hants, larvae were found from which H. Andrews reared two moths (C. de Worms).

SUMMER BROOD OF *C. l. livornica* SEEN OR CAPTURED IN 1943.

Early in Aug. at Walkern, near Stevenage, Herts, a ♂ *C. l. livornica,* identified by Dr. A. H. Forster, and also a *Herse convolvuli* were found dead in a searchlight and given to Rev. W. D. D. Greenham (*Entom.,* **77**: 11, and *Trans. Herts. N.H. Soc.,* **22** (2): —).

Aug. 23, at Cranleigh, Surrey, a perfect ♀ was taken over Petunias at dusk by Dr. H. B. D. Kettlewell (*Ent. Rec.,* **55** (11)).

Aug. 28, 29 and Sept. 16, at Horam, N. of Eastbourne, at dusk over a mass of *Nicotiana* blooms, at least 15 were seen in association with about 30 *H. convolvuli* also feeding. On Aug. 31, P. E. N. Hitchins captured a ♀ and W. Murray a ♂ that evening and two ♂♂ on Sept. 16. *H. convolvuli* were netted on both occasions as well.

In Aug., at Maindenhead, 3 seen by Maj. R. O. R. Kenyon-Slaney at dusk (*Country Life,* Jan. 14: 76).

Sept. 3 and 5, at Bournemouth, two perfect specimens taken resting on grass by F. M. B. Carr (*Entom.,* **76**: 238).

Sept. 4, at Churston Ferrers, near Brixham, Devon, one was captured and released by K. R. Ward (*Western Morning News,* Sept. 24).

Sept. 4 and 6, at Highworth, Wiltshire, C. H. Wilson took a fresh ♂, identified by G. T. Adkin, of two reported in kitchen gardens in the Vale of White Horse (*Field, Oct.* 23: 432).

Sept. 6, at Aberdeen—the most northerly record and first known in Aberdeenshire—a ♀ was found resting on stone in a street and brought to D. Sangster. Specimen was identified by Dr. G. D. Morison of Marischall College (*Entom.,* **76**: 207).

Sept. 8, at Rustington, near Littlehampton, Sussex, a fine but sterile ♀ was taken at dusk on honeysuckle by Lt.-Com. G. W. Harper, R.N. (*Entom.,* **76**: 207).

Sept. 8 and 16, at Maidencombe, near Torquay, a ♀ was captured on 8th and another, probably a ♂, seen on the 16th by F. H. Lees.

Sept. 14, at Trowbridge, Wiltshire, a ♂ was found by J. W. Weddell (C. de Worms).

Sept. 15, at Ringwood, Hants, a ♀ in very good condition was taken, with *H. convolvuli* present, on *Nicotiana* at early dusk by C. J. Bellamy (D. Watson).

Sept. 17, at Caversham, Berks, a ♀ found in a garden by Paul Betts (C. Runge).

Sept. 19, London, N.W.1, a good specimen seen at white *Nicotiana* in Regent's Park by Lord Methuen in the evening (*Country Life,* Oct. 15: 692; Dec. 17: 1088).

NOTES ON *C. l. livornica* RECORDED ABROAD IN 1943.

In North Moroccan Sahara, a French entomologist, Mons. Rungs, noted 'an unusual abundance of caterpillars during 1943' (per B. P. Uvarov).

In S.E. Tunisia, between Zarzis and Medenin, in the coastal scrub and bush in the early morning of each day from Mar. 2 to 14, one or two freshly emerged were seen but none later. There were then commonly present *Vanessa cardui* in the desert and *Colias croceus* wherever there was cultivation (R. Craske).

Around Madrid, in the provinces of Toledo, Avila and Segovia, José del Catuzo reported that there was a drought in June and July and young vine shoots were attacked by *C. l. livornica.* At Avila between June 12 and 15 about three dozen larvae in first instar were seen. Later in the month several thousand larvae were killed by arsenic spraying or cut out of the vines in the neighbouring provinces; but by the end of the month the larvae had disappeared and no imagines were seen later (Hon. Sec., *Institutio Español de Entomologia*).

In Lisbon, a two months' drought ended on July 8 (*Times*, July 8).

DISTRIBUTION OF STRIPED HAWK-MOTHS IN BRITISH ISLES IN 1943.

Total recorded.	County.	Taken or Bred : Moths.	Larvae.	Sex recorded : ♂♂	♀♀	Autumn records included.
282	Cornwall -	48	6	32	10	3
82	Devonshire -	45	5	22	21	3
57	Gloucester -	24	—	18	11	—
55	London - -	54 bred		12	20	1 wild
24	Wiltshire -	18	—	13	6	3
18	Sussex - -	7	1	4	3	16
17	Eire Counties -	9	1	5	5	—
16	Belfast & Down	10	—	4	5	—
16	Somerset -	11	—	3	7	—
15	Caridgan -	8	—	8	—	—
10	Hampshire -	8	4	2	3	3
8	Kent - -	3	—	1	2	—
7	Berkshire -	4	—	—	1	4
3	Dorsetshire -	3	10	1	2	—
3	Lancashire -	2	—	1	—	—
2	Surrey - -	2	1	1	1	1
11	Singly in : - Aberdeen, Isle of Man, Yorkshire, Caernarvon, Cheshire, Derbyshire, Norfolk, Warwick, Monmouth, Bedfordshire, Hertfordshire	11	5	6	5	2 (Aberdeen & Herts)
626	Grand Total: 266 moths, 175 captures		31 larvae	133 ♂♂	102 ♀♀	36 autumn

In these totals 499 moths were recorded as immigrants; plus 36 summer brood; plus 91 bred specimens. Very few pupae lived through the winter unforced.

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HON. SEC., INSECT IMMIGRATION COMMITTEE: 'The Striped Hawk-moth' (S.E.U.S.S., *Bull.* **82**: 2).

O'FARRELL, A. F. 'The Striped Hawk-moth *Celerio lineata livornica* Esp. in County Down' (*Irish Nat. Jl.*, **8** (4): 112).

For historical studies of the species see *Trans. R. ent. Soc. Lond.*, **86**: 345; **92**: 109.

FIRST AUTHENTIC RECORD OF *CHORTHIPPUS VAGANS* Ev. (Orthopt., Acrididae) IN BRITAIN.

By W. R. FRAZER.

A re-examination of some grasshoppers of the genus *Chorthippus* taken by me on 9th July, 1934, on a heath north of Wareham, Dorsetshire, revealed that in two of them the typical sulcus was in the middle of the pronotum, the posterior margin of the pronotum was rounded, and the lateral carinae were rounded at the angles. As these points suggested the possibility of the insects being *Ch. vagans,* they were submitted to Dr. Uvarov, and he and Dr. Zeuner have kindly examined them and identified them as *Chorthippus vagans* Ev. Both specimens are female, and one of them has been accepted by the British Museum (Natural History).

Ch. vagans was introduced as a British species by Dr. Uvarov in 1922 on the evidence of a specimen from an uncertain British locality (*Ent. mon Mag.*, 1922, No. 93, p. 211), and the present specimens are the first to be recorded from a definite locality in the British Isles. The species, however, is known to occur in the Channel Islands (Jersey), where it is even abundant (Zeuner, 1940, *Proc. R. Ent. Soc. Lond.*, B, **9**: 105).

It is desirable that search should be made for further specimens, and I regret not being able to give the precise place where the insects were taken. It was, however, somewhere in the area north of Wareham between the Wareham — Sherford Bridge road, the Old Decoy Pond, and the path parallel with Sherford River. I think that it was on or by the path running from the Decoy House to the Sherford Bridge road on the north side of the pond on the section between the pond and the road, or on or by the easterly beach of the pond itself.

BRACHYOPA SCUTELLARIS Rob.-Desv., 1844 (Dipt., Syrphidae) IN A COTTAGE GARDEN.

By Capt. E. Rivenhall Goffe, R.A.O.C. (retd.).

This species was introduced to the British list by Mr. J. E. Collin in 1939, when he showed by an examination of the pubescence of the antennal arista, of the sensory pit on the inner side of the third antennal segment, and of certain other characters, that we had four species of this genus in Britain instead of one (*B. bicolor* Fall.) only.

Mr. Collin found *B. scutellaris* Rob.-Desv. to be the most common and widely distributed of the four species in Britain, and this has been my experience also. The larvae of *Brachyopa* spp. are believed to feed in the sap of diseased or wounded trees, and have more than once been taken from the exuding sap of trees into which larvae of the lepidopterous genus *Cossus* have bored; the species are, therefore, normally found only in old woodlands and forests.

I took a single female of this species on my garage window on 2nd May, 1930, but of course I determined it at the time as *B. bicolor*. At that time we had a decaying beech tree at the end of the garden in which I assumed it to have bred; this tree was blown down the following autumn, and I did not see the fly again in the garden until the present year, 1944, when about a dozen specimens were netted and several others seen during May and early June. This time the species appears to be attached to an old hazel tree which is covered with ivy and is entirely surrounded and enclosed by a new growth of younger saplings. The insect flies round this tree group, settling on the leaves on the sunny side, and does not seem to wander more than a few yards away from it, though several were taken on a near-by window.

The species of *Brachyopa* have not a very syrphid-like appearance either in flight or at rest, and, until the venation of the wings is examined, they are easily mistaken for one of the small species of *Anthomyidae*, *Cordyluridae*, etc., which have a reddish-yellow abdomen and greyish thorax, and which always seem to be about at the same time. A selection of these was collected and Mr. H. L. F. Audcent has kindly determined them as *Scopeuma* (=*Scatophaga*) *maculipes* Zett., *Dryomyza decrepita* Zett., *Alleostylus diaphanus* Wied., *Phaonia variegata* Meig. and *Tephrochlamys canescens* Meig.

Reference

Collin, J. E. 1939. Notes on Syrphidae (Diptera), III. *Ent. mon. Mag.*, 75 (900): 104-9.

TUBIFERA (= *ERISTALIS*) *VITRIPENNIS* Strobl, 1893, A SPECIES OF SYRPHIDAE (Diptera) NEW TO BRITAIN.

By Capt. E. Rivenhall Goffe, R.A.O.C. (retd.).

The species brought forward as British under this name is perhaps on an average just a trifle smaller than *T. horticola* Degeer, and bears a superficial resemblance to that species. It belongs to the group which has a plumose arista, and in the table of species for the genus *Eristalis* given by Verrall (1901 : 497) it runs down to *horticola* Deg. in both sexes, though it is then found to differ from that species in a number of details, notably in having black pubescence on the 3rd abdominal tergite and the hind tarsi pale at the base. If use be made of these characters it would run down to *rupium* Fabr., but it has a much less conspicuous wing fascia than that species, particularly in the male, and has the hind femora much more extensively pale at the base.

In the tables given both by Lundbeck (1916: 414-5) and by Sack (1931 : 254-5) the insect runs down to *vitripennis* Strobl; the somewhat brief description given by that author fits my specimens quite well, whilst they agree so well with the detailed description given by Lundbeck that I feel no doubt whatever that he had the same species before him.

Lundbeck was not quite sure of the correctness of his determination of the species, for he wrote (*op. cit.* : 439): ' It is with some hesitation I determine it as *vitripennis* Strobl, the sole species besides *rupium* and *alpinus* with pale base of hind tarsi; Strobl's specimens seem to have the tarsi more pale, and he gives the stigma as longer than in *horticola,* which is not the case with my specimens, but he is seen to have had only few specimens, and I think the differences are of no consequence.' In my series (2 ♂♂, 6 ♀♀) the males and one female have the stigma the same size as in *horticola,* but the remaining 5 ♀♀ have it a trifle longer, whilst there is a certain amount of variation in the pale area of the tarsi.

Sack's description (*op. cit.* : 262) is very brief and does not help us much: he refers to a ' long brown stigma,' but I think this is his misreading of Strobl's description (genau wie bie *alpinus* ♂, aber längerem braunem Randmal) and is not taken from specimens. Sack's paragraph of only eight and a half lines reads much more like an extract from other authors than a description made from a study of material.

Existing conditions in Europe make it impossible to investigate Strobl's types; but I feel very little doubt that the determination is correct—if one allows for the difference in latitude between the type locality (Austrian Alps) and Denmark and Scotland—and none whatever that our species is the same as Lundbeck's. I am content, therefore, to accept Lundbeck's determination until it is proved to be wrong.

The following table will serve the dual purpose of giving a brief description of *T. vitripennis,* and of differentiating it from the only two other species recorded from Britain with which it could possibly be confused:—

T. vitripennis.	*T. horticola.*	*T. rupium.*
Facial hairs orange.	Facial hairs yellow.	Facial hairs yellow.
Middle black line on face narrow and not reaching up to the antennae.	Middle black line broad.	Middle black line narrow.
Ocular pubescence blackish.	Ocular pubescence brownish.	Ocular pubescence brownish.
3rd antennal segment blackish.	3rd antennal segment often reddish on at least lower half, especially ♂.	3rd antennal segment blackish.
Frontal lunule chestnut-brown.	Frontal lunule chestnut-brown.	Frontal lunule sepia-brown.
Mid-wing fascia practically absent in ♂, slight but distinct in ♀.	Mid-wing fascia distinct in both sexes.	Mid-wing fascia dark and conspicuous in both sexes, but most so in ♀.
Squamae and fringes pale yellowish.	Squamae and fringes pale yellowish.	Squamae and fringes brownish.
Yellow side spots on abdomen small and not extending below 2nd tergite.	Yellow side spots on abdomen large and often extending to 3rd tergite.	Yellow side spots on abdomen small, obscurely darkened, and not extending below 2nd tergite.
Abdominal tergites shining.	2nd tergite dull, only 3rd and 4th somewhat shining.	Abdominal tergites shining.
Abdominal pubescence pale at base, black along lower margin of 2nd tergite, on all 3rd tergite except upper corners and sides, and on middle only of 4th tergite in ♂, more extensively in ♀.	Abdominal pubescence all pale except along lower margin of 2nd tergite.	As in *T. vitripennis.*
1st and 2nd tarsal segments and sometimes base of 3rd segment pale.	Front tarsi blackish, sometimes brownish at base; 1st and 2nd segments of middle tarsi yellowish, hind tarsi blackish.	1st and 2nd segments of front tarsi blackish in ♂, partly paler in ♀, of middle and hind tarsi pale in both sexes.
Hind femora with basal half pale in both sexes, ♂ with long black hairs on apical half.	Hind femora with extreme base only pale in ♂, more extensively pale in ♀. No long black hairs on apical half in ♂, only tiny black bristles below.	Hind femora black except just the knees in ♂, pale at the base in ♀, and long black hairs on apical half in ♂.

My first capture of *T. vitripennis* was on 22nd June, 1933, when I took a single male at Granish, Inverness, visiting flowers in the garden of the cottage at which I was staying. On 27th June I took a female in the same garden. In 1934 my visit to Scotland was a little earlier and I did not see the species. In 1936 I spent the first two weeks of July in the Nethy Bridge district, and I took 1 ♂ and 5 ♀♀ on dates ranging from 5th to 9th July. In 1937 and 1938 I again visited Scotland in late July and early August, and covered a considerable area to the north and west, but did not meet with the species, although numbers of *T. rupium* were seen.

The species is apparently most nearly allied to *T. rupium* Fabr., as was suggested by Lundbeck, and is found in similar mountain or highland situations. It seems to have rather a restricted time of flight and to be single-brooded, as all my specimens were taken between 22nd June and 9th July, whereas *T. rupium* was seen and taken well into August and *T. horticola* over an even longer period. In Austria it is apparently double-brooded, as Strobl's captures were of females in May and males in July.

On mentioning these captures to Mr. C. J. Wainwright, he showed me a female taken in the Llyfnant Valley, Montgomery, Wales, on 8th August, 1893. Mr. Wainwright had provisionally named the specimen as *vitripennis* Strobl, but had not published the capture as it was a single specimen, and he was not sure that it was not an aberration of another species. The specimen is unfortunately rather teneral, but in my opinion it is undoubtedly *vitripennis*. The capture extends the known distribution of the species in Britain to the mountain districts of Wales, and the later date (August) suggests that the species may be double-brooded there as in Austria.

T. vitripennis is apparently well spread over the highland area north and east of Aviemore, Inverness, my specimens being from Granish, Nethy Bridge, Sliemore and Speybridge in Inverness-shire, and from Bridge of Brown and Bridge of Avon in Banffshire. It should be looked for in mountain districts in late June or early July, particularly those areas from which *T. rupium* has already been recorded. In England, Wales or Ireland it should be sought in elevated districts in May and August.

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THE GENUS *BLERA* Billberg, 1820 (Dipt., Syrphidae).

By Capt. E. Rivenhall Goffe, R.A.O.C. (retd.).

In the 'Catalogus Dipterorum' (Kertész, 1910: 35) the generic name *Blera* Billberg, 1820, is shown as a synonym of *Chilosia* Meigen, 1822, with a note that it is a *nomen nudum*. Both statements are, however, incorrect: neither of the originally included species has ever been referred to *Chilosia* Meig., whilst a generic name which is properly published with two named Linnean included species can hardly be considered a *nomen nudum*.

Billberg's book, as its title implies, was a catalogue of the insects in his own collection rather than a work on the Insecta. It was not well received at the time (Hummel, 1825; 1826), and when in 1822 his library and collections were completely destroyed by fire the main interest of the book vanished two years after it was published, together with all the unsold copies (Hummel, 1825).

The Diptera are dealt with on pp. 112-23 and *Blera* is raised on p. 118 as follows:—

Divis. Alis divaricatis.
Sub-divis. Antennis capite medio brevioribus.
Blera Eg.—*Eristalis* Flln.—*Syrphus* Fbr., Ltr.—*Musca* Ol.
fallax Svec. Linn. *coemiteriorum* Svec. Linn.

It is explained that 'Eg.' = auctor hujus operis, i.e. Billberg.

Very little notice appears to have been taken of Billberg's genus. It was referred to by Zetterstedt (1842: 37), who included it in the synonymy of *Eristalis*:—

79. *Eristalis* Fabr. Antl.—Fall.—*Cheilosia* Megerle, Macq., Meig. Suppl.—*Syrphus* Panz., Latr., Meig.—*Elophilus* Latr.—*Musca* Linn.—*Blera* Billb.

Both Billberg's included species were referred by Fallén (1817) to *Eristalis*—*fallax* Linn. appearing as *semirufa* Fabr.

Zetterstedt (1838: 587, 613) referred *fallax* Linn. (= *semirufa* Fabr.) to *Milesia* Latr. He left *coemiteriorum* Fall. in *Eristalis* Fabr., but suggested that it was not the same species as *coemiteriorum* Linn., nor of *coemiteriorum* Panz., which he thought to be *Chrysogaster solstitialis* Fall.

From that time onward Billberg's work appears to have been ignored until 1875, when Scudder brought forward a number of his names in Lepidoptera. The controversy which ensued is well expressed in a paper by Walsingham and Durrant (1902); this paper dealt with Lepidoptera only, but some of the points discussed are of general interest.

No dipterist author seems to have referred to *Blera* Blbg. from 1842 until 1901, when Verrall (Cat.: 33) included the name as a synonym of *Chilosia* Meig., quoting Zetterstedt as his authority for so doing. Verrall, however, gave the reference to Zetterstedt incorrectly as Vol. II instead of Vol. I.

Verrall's action was possibly based on the fact that Zetterstedt's genus *Eristalis*—under which that author had given both *Cheilosia* Meig. and *Blera* Blbg. as synonyms—included the species which he (Verrall) was referring to *Chilosia*.

Verrall's action cannot, however, be justified, as neither of Billberg's two included species has ever been placed either in *Cheilosia* Panz. or in *Cheilosia* Meig.

Kertész (1910: 35) placed *Blera* Blbg. as a synonym of *Chilosia* Meig., doubtless following Verrall.

In 1911 C. W. Johnson brought the name *Blera* forward in America (Johnson, 1911: 73) and designated *Musca fallax* Linn. as the genotype, confirming his action two years later (Johnson, 1913: 294). The effect of this, as Johnson himself pointed out, was that *Blera* Billberg, 1820, would have to replace *Cynorhina* Williston, 1886, whose type species (*Milesia analis* Macq., 1842) was considered to be congeneric with *Musca fallax* Linn.

Curran (1924: 126) suggested that, as no type species for Billberg's genus was named until 1911, Williston's 1886 genus had priority; but this is not a correct interpretation of the International Rules, and, judging from opinions that he has since expressed, I do not think that Dr. Curran would now maintain this view. The genotype for *Cynorhina* Will. was not designated until 1910.

Sherborn (1922: xxiv) expressed agreement with Walsingham and Durrant's remarks, and in 1924, when indexing *Blera,* he added to his entry ' [n.d., 2 nom. triv. append. sunt] '. He had evidently overlooked the fact that a genotype had been designated in 1911.

Johnson's paper appears to have been ignored on this side of the Atlantic; but his designation is valid under the International Rules, and it is quite clear, therefore, that *Blera* Billberg must replace *Cynorhina* Williston in our lists. The full synonymy is as follows:—

Blera Billberg, 1820, *Enum. Ins.*: 118. Genotype *Musca fallax* Linn., 1758, by subsequent designation of JOHNSON, 1911, *Psyche,* **18** (2): 73.

=CYNORHINA Williston, 1886, *Bull. U.S. Nat. Mus.,* **31**: 209. Genotype *Milesia analis* Macquart, 1842, by subsequent designation of COQUILLETT, 1910, *Proc. U.S. Nat. Mus.,* **37** (1719): 530.

Blera fallax (Linn., 1758) is the only species of the genus that has been recorded from Britain.

I am indebted to Dr. F. H. Haines for tracing Verrall's incorrect reference to Zetterstedt, and to Mr. W. H. T. Tams for making me a copy of the relevant part of Billberg's work.

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CORDULEGASTER BOLTONII (Don.) (Odon.) TAKING *APIS MELLIFERA* Linn. (Hym.).

By W. PARKINSON CURTIS, F.R.E.S.

On 9th July, 1944, in my garden at Bournemouth during the late afternoon a large dragonfly, which from details kindly given to me by Lt.-Col. F. C. Fraser, M.D., F.R.E.S., I am confident was *Cordulegaster boltonii* Don. (=*annulatus* Latr.) was hawking for flies. It picked up several small Diptera of the housefly facies from the leaves of *Delphinium*. It made a careful examination of *Tortrix unifasciana* Haw., which I had disturbed from some herbage, but did not make any serious attempt to capture it. It examined several Syrphid flies which were on *Delphinium* blossom but made no effort to take them. It also examined three times a worker honey bee (*Apis mellifica* Linn.), which it made no attempt to take as long as the bee was honey gathering at the *Delphinium* blossoms, but, to my surprise, directly the bee took wing it was seized and eaten.

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EDITED BY

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JOURNAL OF THE SOCIETY
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NOTES ON *TROCHILIUM CRABRONIFORME* (Lew.) (Lepidoptera).

By Lt.-Col. F. C. Fraser, M.D., F.R.E.S.

On 9th September, 1943, whilst hunting for larvae on an old sallow, on Wallis Down, Dorset, I noticed the empty pupal case of a *T. crabroniforme* projecting from a boring about a foot above ground-level. The case was quite fresh and it looked as if the imago had emerged during the previous one or two days. Remains of other cases found during August were already moulded or more or less disintegrated, so that it is legitimate to infer that a specimen of this moth had emerged some two months after its normal seasonal incidence. I decided to examine these borings in the following spring and carried out my investigations actually from the beginning of June this year, 1944. The trees infected are very old specimens averaging at least a foot in diameter at the same distance above ground-level and probably not less than thirty years of age, this, for some, being certainly a broad under-statement. Some of the older trees are so badly infected as to resemble the attacks of *Cossus,* and it would appear that, once a tree has been attacked, the moths return habitually to it, until we get something in the nature of a colony. Trees bordering a stream were more likely to be attacked than those in drier situations, and even a thick coat of ivy had failed to protect several. I opened up some twenty borings of the larger size and obtained about one dozen pupae, two only being damaged in the process. This latter was carried out by slicing the trunk with a heavy sharp bill-hook until the stain, which percolates through the neighbouring wood from the insect's burrow, was come upon, when greater care in cutting down on the burrow had to be employed. The tunnels were found to be not more than eight inches in length, of uniform diameter and very smooth and clean: the pupae were invariably head downwards in a finely spun but weak cocoon situated at the upper end of the tunnel. The shortest tunnels were not more than six inches in length and the pupal chamber at the upper end was fusiform and about the diameter and shape of a ·303 bullet. The pupae obtained were put into corrugated cardboard cylinders to await emergence, the

edges of the cylinders being left loose so that they could be opened up at any time to observe emergence. Nothing happened until the first week in July, when the pupae became very active, each revolving on its long axis and worming or rather screwing its way along the cylinders until it appeared at the open end, after which progress was continued until only the last three or four abdominal segments remained in the cylinder. In some cases, the pupae continued to wriggle their way until they fell clear of the cylinders, but this was rare. As they hung suspended from the mouth of the cylinders, it was noted that they were invariably ventrum uppermost, a posture which I correctly diagnosed as due to the position of the cremasteric hooks. These

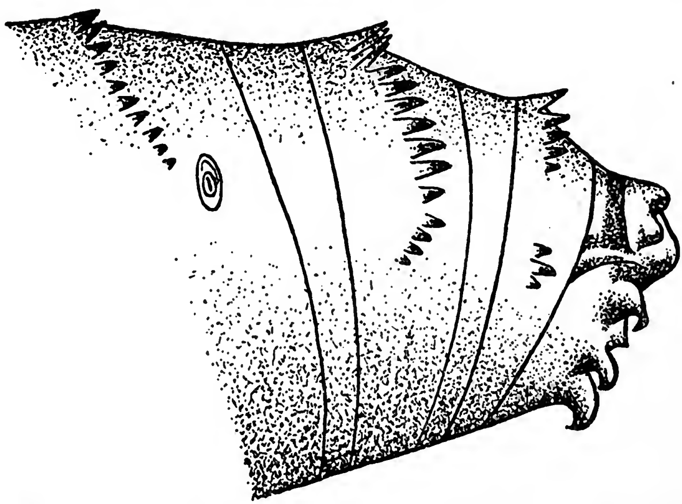

Fig. 19.—Terminal segments of the pupa of *Trochilium crabroniforme* (Lew.) demonstrating the cremasteric hooks and spines.

latter are situated on the anal-ventral angle of the final segment; the weight of the pupa, as it hangs precariously from the burrow, levers the end of the abdomen upwards towards the roof of the burrow and so brings the cremasteric hooks into contact with it, where they secure a firm hold and prevent the pupa falling out during the emergence of its owner. The progress along the tunnels is aided by the rows of spines, partly by a screw-like action and partly by repeated telescoping of the segments followed by protrusion after the spines have obtained a point d'appuis to thrust from (fig. 19). It is intriguing to ask oneself if this primitive use of the cremasteric hooks is not one of the early links in the evolution of the habit of some of the higher Lepidopterous pupae hanging up by their tail?

My pupae emerged during the second week in July, some imagines being a little deformed probably due to keeping them too dry. I was interested to note that the wings, on first emergence, are coated thickly with scales, which are lost with the very first fluttering of these organs. I particularly wished to note this, as I have found some of the Oriental species, on first emergence, have the wings so thickly coated with scales as to be quite opaque. *Crabroniforme* did not come up to this standard, but the veins were thickly coated, as also the borders of the wings.

Whilst digging out the pupae, it was observed that woodpeckers had levied a heavy toll on the insects, and boring after boring was found to have been robbed. In most cases the bird had hit off the right level at once, but, in quite a number, two, three or even four openings into the tunnel had been made, one above the other, until the larva or pupa had been finally winkled out. Between the depredations of these birds and myself, there did not seem much room for any or many of the insects to have escaped, so that I was agreeably surprised to find a fine female sitting on one of the trunks on 12th July. This one was bottled promptly, but it occurred to me afterwards that I might have waited to see if *sembling* was practised by these insects. On the 15th a pair were found *in cop.* on a trunk about a foot above ground-level and later a male and female were found in a similar situation, the male a few inches only from the female and in a great state of excitement. The male was bottled and I sat down to await events. Some five minutes later, another male arrived and, after flying round in circles, quickly found his mate and copulation occurred. On the 16th, on the self-same tree, which had already given me some half-dozen specimens, I found yet another female. A few minutes later she was joined by a male, but I prevented mating by introducing him to the cyanide bottle. Less than five minutes later, a second male flew round and settled on a twig some six feet above the female. It appeared to be taking a fresh scent, for after a couple of minutes it flew up and came almost direct to the female. The behaviour of the latter was of interest, for it was quite evident that she heard the buzzing of the male long before it reached her vicinity: she erected herself on her fore-legs and turned round and round, giving an occasional buzz by whirring her own wings, but never attempting to take to flight. After I had secured each male, she evinced great restlessness before again settling down, and on two occasions wandered far up the trunk of the tree and lost herself in the ivy clothing it. Twice I had to coax her on to the tip of my finger and restore her to the bottom of the trunk, otherwise she would have got quite out of reach. She never once attempted to fly, and it seems clear that they do not do so until after copulation. I took five males with this one female before securing it and coming away. The last specimen was taken on 26th July, an

enormous female, which, after I had bottled it, I found was overlaying a very small male. It is possible that the female lays a few eggs as soon as copulation is over, for I found a batch of eleven eggs on this same tree, laid on a twig sprouting from the trunk about a foot from ground-level. These eggs had not hatched four weeks later, but some had after seven weeks; I am unable to give the exact period of incubation. They are purplish-brown in colour, oval, flattened markedly on two sides and rather smaller than the egg of *B. quercifolia*.

I find a number of erroneous statements as to the habits of these insects. Thus Newman states that the larva spins a tough cocoon in twigs, so small that they seem scarcely large enough to contain the insect. South, Meyrick and Kirby all state that they feed in *stems* of *Salix* or willow, etc., whereas all those I have remarked upon were breeding in *trunks* mostly a foot or more in diameter. The newly-emerged insect is said to fly directly the sun is up or shines upon it: I found females resting on trunks as late as 11 a.m., and indeed it seems that they would sit thus all day if a male failed to turn up during that time. The pupa emerges from its tunnel overnight, and emergence of the imago took place round about 9 a.m., or even later, in all my specimens.

NOTES ON THE PUPATION OF *E. RUBI* Linn. (Lep.).

By Lt.-Col. F. C. Fraser, M.D., F.R.E.S.

A great number of fables appear to have crept into entomological literature, and the fiction is copied from text-book to text-book until a factual semblance is given to them. To this category belongs, I believe, the assertion that the larva of the common fox moth (*E. rubi* L.), after its winter's sleep, leaves its hibernaculum and strolls forth to bask in the sun of early March. I have lived on the borders of a heath for eight years now where these larvae are very common and where they may be met with on the heather every few yards in most years, and yet on only one single occasion have I found a larva in the open during March or at any other time after their winter sleep. This particular specimen had evidently not found its hibernaculum suitable to pupate in and had set forth to find a 'better hole.' Three years ago (1941), I collected fifty specimens at the end of October just before the time they retire to their winter quarters and dumped them all in a confined area on the heath. The following spring I visited this spot regularly day after day, but never a larva did I come upon, save that in delving at the roots of the heath in this spot I uncovered one still sleeping. On taking this indoors, it

roused itself and almost immediately started to spin a cocoon amongst the heather in which I had placed it. It duly emerged as a fine female. In 1943 I repeated this experiment, but, on this occasion, bred one hundred larvae to the last instar with 100 per cent. of successes and at the end of October dumped them amongst thick grass on an embankment at the bottom of my garden, where they slowly dispersed in the course of forty-eight hours, after which none was visible. During the ensuing winter I found at least half a dozen lying dead, shrivelled and moulded in different parts of the garden, and during December, whilst tidying up another grassy bank near the one where I had dumped my larvae, found five larvae bunched together in a cavity deep in the roots of the thickly matted grass. I covered these up carefully and desisted from further tidying up of this and like localities. During March, 1944, not a single specimen was found out in the open, but three specimens were observed with their head and first two or three segments peeping from the grass. A search for more larvae found some twenty-five hiding deeply amongst the matted roots and dead grass; a few were moulded and dead, but the greater number were still sleeping. Some were taken indoors and all spun up during the ensuing two days. Others left in situ *all spun up in their hibernaculum*. The latter is a moderately smooth cavity lined with grass such as a dog would make for itself by its characteristic feral habit of turning round and round to lay the grass smoothly. The cocoon was spun in this cavity end-on and a loose chimney was spun up through the grass almost but not quite into the open. In some cases I detected the upper end of such chimneys or emergency exits. From these observations I am led to conclude that the fox moth larva usually, or perhaps invariably, spins its cocoon and pupates in its hibernaculum and that the few which have been come upon in the open on a sunny March day are purely adventitious wanderings possibly prompted by a winter deterioration of the hibernaculum or its invasion by some Coleopterous or other marauder.

EUCHLOË CRAMERI Butler (Lep.) OCCURRING IN BRITAIN.

By W. Parkinson Curtis, F.R.E.S.

In August, 1887, a Mr. C. E. Prince, then a schoolboy, was collecting butterflies on the Castle Heights at Dover. Amongst his captures were three white butterflies which he set, and set very badly, one on a common pin, one on a 'lil,' and one on a very small white entomological pin. He does not seem to have valued his captures very much, for the abdomen of one specimen,

a female, was missing. In that state he gave them to the late Mr. Alan Druitt, who placed them as they were in his cabinet over the label *Pontia daplidice* Linn., but added in his own writing the history of their capture, and so they remained until Mrs. Druitt very generously gave me the collection.

I had never liked the look of the two males, although I thought the female was correctly labelled. In the interim between my first seeing these insects and the present day, I have taken a good series of *Pontia daplidice* from a number of French localities, and I have also taken and bred *Euchloë crameri* in and from the French Alps. Recently it became necessary to rearrange my Pierids and incorporate accessions, and accordingly I incorporated Mr. Druitt's specimens. I reset these three whites as well as I could, having regard to their condition, and submitted them to a very close examination. It is, of course, well known that *Pontia daplidice* and *Euchloë crameri* are in some of their forms superficially rather alike, but in neuration they are decidedly distinct. *Pontia daplidice* has 6 and 7 of the forewing on a long stalk and there is no vestige of 8. *Euchloë crameri* has 6 and 7 on a very short stalk and well before the apex 8 rises from 7 and curves up to the apex whilst 7 curves downward to the termen.

Of Prince's three captures the female is a typical second brood *Pontia daplidice* Linn., whilst the two males are both second brood *Euchloë crameri* Butler. *Euchloë crameri* is known to occur in Northern France, though less commonly than it does south of Paris.

The capture of *Pontia daplidice* at Dover is not a particularly startling event, but I know of no previous record of the capture of *Euchloë crameri* in Britain.

A PLEA FOR THE 'MICROS.'

By Wm. Fassnidge, M.A., F.R.E.S.

Having read with great interest and pleasure the recently published second work of Mr. P. B. M. Allan, (*b*) 'Talking of Moths,' 1944, I re-read his first work, (*a*) 'A Moth-hunter's Gossip,' 1937, and am moved to venture a few remarks, which I ask the author to consider as springing from his own very stimulating chapters. No criticism whatever is intended, but I cannot refrain from expressing my surprise and disappointment that so gifted an observer, as Mr. Allan most certainly is, should attribute to 'laziness' ((*a*) Preface, p. 9) the fact that he is not interested in the smaller moths. The fact I must accept, however regretfully, but Mr. Allan will forgive me if I take the liberty of doubting the reason.

All true entomologists are ' more interested in live than in dead insects,' therefore the alleged labour and difficulty involved in setting up long series of caught or bred ' micros ' need not be undertaken nor considered here. All are eager to add some small item to our store of knowledge and, like Mr. Allan, burn to add new species to the British list or to decide firmly the status of the many species whose claim to be British rests on an odd capture or on ancient records. Here the ' micros ' offer a rich field for a leisured and patient investigator of Mr. Allan's type, and I feel sure he would realise some of his ambitions if he would give some small share of his time and energy—yes, his energy, for he is not really ' incorrigibly lazy,' as he is pleased to tell us—to the study and observation of the ' micros.'

I hope to be forgiven if here follows a brief account of the first incident which opened my eyes to the richness of this field of study. More years ago than I like to recall, a young lady visitor, having duly admired various cabinet drawers of the more showy butterflies and moths in my collection, laughingly laid me a trifling wager that I could not set up a really tiny moth. Of course, I accepted the challenge and we set out one lovely Sunday afternoon to procure the ' corpus vile.' We walked along the Swaythling Canal near to Woodmill, Southampton, where crack willows grow in patches by the water's edge, and there, sunning itself on a willow leaf, was a beautiful tiny orange and black moth, small enough to be acceptable to both parties. I tremble even now to think that I just casually boxed it, scorning to use a net. Of course, I won my wager, and in due course the specimen went with others to the late Prof. E. G. R. Waters, to return proudly bearing the name of *Chrysoclista bimacullella* Haw. Ever since then I have tried to find others by every conceivable method. I have searched trunks and leaves, beaten willows and sallows in the same locality and in many others that seem to be suitable. Throughout the war I searched regularly the willows in and near Poole Park, where this species should occur. I have sought out all that the continental authors have to say, but so far my failure is as complete as Mr. Allan's failure to find *Catocala fraxini*.

It may be interesting now to examine my reactions concerning Mr. Allan's great longing to take *fraxini*, among other rare species, vagrants and immigrants, a longing I confess to having shared. I have spent many Easter and summer holidays in France and Spain. I have collected in localities where most of the species so greatly desired abound—*fraxini, vitellina, lunaris, alchemysta, lambda, conspicillaris*, etc. I have taken most of them freely, and frankly I can no longer understand the burning desire to capture them in England, where they are either casual immigrants or at the extreme limit of their distribution. I had hoped that our insularity was disappearing, and that no special virtue or pecuniary

value would ever again be attached to the fact that an insect had flown across—or otherwise traversed—a few miles of salt water. As Mr. Allan so amusingly and painstakingly points out, the door to fraud and imposture stands wide open.

Let us then observe and study the moths we have at our door, all of them, including the 'macros,' of course, which have already received more than their share of multiplicate observation and study, but especially the 'micros,' which have been undeservedly and unnecessarily neglected. In this field there is ample room for discovery of species new to Britain and for observation of life habits still unknown. Nor need any observer go far from his own home, so great is the number and diversity of the small moths. The most hardened 'macro' collector might begin by taking those 'micros' he is certain to see at light or sugar, or on his rambles abroad. This may well be the first step on the road that leads to the abolition of all artificial divisions of the order Lepidoptera into butterflies and moths, 'macros' and 'micros,' and especially to the certainty that no division based on size is scientifically possible. Perhaps our moth hunter may become a student and observer of the whole Order, and will then find enough varied and fascinating material for the longest life's work.

A DORSETSHIRE LOCALITY FOR *PERONEA CRISTANA* Fb. (Lep.).

By Wm. Fassnidge, M.A., F.R.E.S.

In May, 1944, I paid my first visit to Handley Common with Dr. A. J. Walker, of Parkstone, who is also an entomologist, and who had to visit a patient near by. An enormous stretch of arable and pasture land has replaced most of the common, but the Ancient British camp has not been touched, and enough is left on two sides to give a faint idea of what the locality was once like, clearly a paradise for the entomologist and a likely haunt of *Peronea cristana*. On 25th August we were again able to visit this spot, and my expectations were fulfilled. In spite of being forced to use only the right hand for beating, then to drop the stick and swiftly substitute the net, I caught about twenty *cristana,* and missed a great many more. What most struck me was the complete absence of melanic forms, so common in the New Forest, and the occurrence of unicolorous and subunicolorous forms. This locality would undoubtedly repay close attention when peace-time conditions make it once more accessible to the Bournemouth entomologists.

ETHMIA DECEMGUTTELLA Hb. (Lep.) IN DORSETSHIRE.

By Wm. Fassnidge, M.A., F.R.E.S.

Feeling very tired after beating for *P. cristana* on 25th August, 1944, I sat down to rest and to do the crossword puzzle in the *Sunday Times,* where Handley Common merges into woodland by the keeper's cottage known as ' Badger's Glory.' To my astonishment and delight, I saw beside me small plants of *Lithospermum officinale,* growing in the shade in fairly thick vegetation, eaten and skeletonised by larvae that could only be those of *E. decemguttella,* which I had sought in vain for at least twenty years. And there they were in abundance, lying along the midrib on the undersides of the leaves, in all stages of growth from tiny to nearly full-fed. They dropped off at the least disturbance from the few slight threads they spin, and were very lively after the way of most ' micro ' larvae. Unfortunately they refused to eat all allied garden plants offered them later when the supply of *Lithospermum* withered, and many died of starvation. Nor did they form their cocoons in the soil as they are said to do, but spun tough whitish cocoons just where the jampot lid touched the glass, in the most awkward situation possible.

A NEW METHOD OF MOTH HUNTING.

By Wm. Fassnidge, M.A., F.R.E.S.

One of the most striking features of the heathy woodlands near Poole and Wimborne is the almost tropical luxuriance of the rhododendron clumps. Long ago I had explored the possibilities of spruce and yew as offering shelter and a suitable place of hibernation for many species of insects. I have beaten into the tray from October to March, or on dull days in other months, large numbers of *Sarrothripus revayana* Tr., *Cerostoma radiatella* Don., chiefly from yew trees, a few *Peronea cristana* Fb. from spruce only, together with large numbers of other insects, while occasionally a most unexpected species has come tumbling down. A friend who bought five acres of woodland near Wimborne, consisting chiefly of one vast clump of ancient rhododendrons, with oaks, hornbeams, Spanish chestnuts and wellingtonias towering above the thicket, set to work to clear enough space for a house, and I often supervised and encouraged his herculean labours. No matter what the month, moths were disturbed in varying numbers, so I impressed my wife to beat

along the edges of the drives and paths, while I stood by with a net. Numbers of insects were beaten out, noctuids, geometers, tortricids, tineids, lace-wings, caddis-flies, Diptera, mostly from the thicker and more shady retreats, the species varying according to weather and season. Several species of deltoids abounded, tineids and *Peronea* spp. were in great variety, *S. revayana* with occasional streaked forms, and now and then a rarity such as *Spatalistis bifasciana* Hb. Even in the depths of winter one could disturb *P. ferrugana* Tr. in numbers, *Depressaria* spp. and various hibernating tineids. More persistent working would probably have yielded a much better bag, but enough was done to show the possibilities of this method, which can be employed at times when other methods yield but little.

NOTES ON SOME FLEA BEETLES FROM SLOUGH, BUCKS.

By E. McC. Callan, B.Sc., Ph.D., A.R.C.S., D.I.C., F.R.E.S.

Flea-beetles comprise the subfamily Halticinae of the large Coleopterous family Chrysomelidae. They are small in size and are aptly named flea-beetles on account of their greatly developed powers of hopping. Their most striking feature is the great enlargement of the hind femora, which house the muscles used in leaping.

The adults are leaf-feeders and include a number of highly injurious species. The genus *Phyllotreta* includes many well-known pests of cruciferous crops, and other flea beetles attack mangolds, potatoes and hops. The feeding habits of the larvae are not so well known, but the majority probably live in the soil, where they feed on the roots of plants.

When working at the Biological Field Station of the Imperial College of Science and Technology at Slough, Bucks., the writer made some observations on flea-beetles. In all twenty-five species were collected during one month from 24th July to 23rd August, 1933, and it is thought that these records are of sufficient interest for publication. Identifications were made with the help of 'A practical handbook of British beetles,' by Norman H. Joy.

Aphthona coerulea Pk.—Common on *Iris Pseudacorus*. Not seen after 8th August.
Apteropeda globosa Ill.—Rare on *Iris Pseudacorus*.
A. orbiculata Marsh.—Rare at grass roots.
Chaetocnema concinna Marsh.—Rare on low plants.
C. hortensis Geof.—Common at grass roots.

Chalcoides aurata Marsh.—Common but not abundant. On willow.

C. plutus Lat.—Common but not abundant. On willow.

Crepidodera ferruginea Scop.—Common at end of July, none seen in August. On *Urtica dioica*. Seen *in copula*.

C. transversa Marsh.—Rare on thistles.

Haltica oleracea L.—Common and very abundant. On horse radish and *Epilobium hirsutum*.

Longitarsus atricillus L.—Rare on low plants. Seen *in copula*.

L. gracilis Kuts.—Rare on low plants.

L. jacobaeae Wat.—Common and very abundant at end of July, none seen in August. On *Senecio jacobaea*. Seen *in copula*.

L. luridus Scop.—Common and abundant. On low plants and at grass roots.

L. pratensis Pz.—Common and abundant. On low plants and at grass roots.

L. rubiginosus Foud.—Common and very abundant. On *Convolvulus* sp. Seen *in copula*.

L. succineus Foud.—Rare on low plants.

Phyllotreta atra F.—Common on turnips, kale and horse radish.

P. consobrina Curt.—Common and very abundant. This flea-beetle and *P. nigripes* F. were the most abundant species on cruciferous crops. On turnips, kale, cabbage, mustard, horse radish and *Sisymbrium officinale*. Seen *in copula*.

P. cruciferae Goez.—Common on turnips and kale.

P. nigripes F.—Common and very abundant. This flea-beetle and *P. consobrina* Curt. were the most abundant species on cruciferous crops. On turnips, kale, cabbage, mustard and horse radish. Seen *in copula*.

P. undulata Kuts.—Common and abundant. On turnips and horse radish. Seen *in copula*.

P. vittula Redt.—Rare on turnips.

Psylliodes affinis Pk.—Common on *Solanum Dulcamara*.

Sphaeroderma testaceum L.—Common on thistles.

EUPISTA (COLEOPHORA) VIBICELLA Hübn. IN DORSET.

By S. C. Brown, L.D.S., R.C.S.

While collecting near Swanage on 26th June, 1942, I found a number of fully formed cases of *E. vibicella* on *Genista tinctoria*. The moths emerged between 16th and 27th July.

Vibicella has only doubtfully been recorded for Dorset. C. W. Dale, Lepidoptera of Dorset, 1886, says: 'A very worn specimen, supposed to be this species, came to light at Studland in July 1878.'

Meyrick gives for the distribution: Sussex to Dorset and Hereford.

I wrote to Mr. Parkinson Curtis, who is preparing a list of the Lepidoptera of Dorset, and asked him if he had any record other than the Studland one.

He replied: ' With regard to *vibicella,* the only note I have got is one at light at Studland by Digby. Digby said originally that owing to its somewhat imperfect condition, it has not been identified. Bankes' opinion as to the correctness of the determination has wavered several times, but finally seems to have settled down to the fact that it was correct.'

It appears probable from the evidence that Meyrick was quoting Dale for his county record.

It is a pleasure to be able to place this insect firmly on the Dorset list.

THE REDISCOVERY OF *ORESBIUS CASTANEUS* Marshall (Hym., Ichneumonidae).

By W. D. Hincks, M.P.S., F.R.E.S.

On 3rd July, 1942, Messrs. C. A. Cheetham, W. O. Steel, my wife and I were collecting on Pen-y-ghent (V.C. 64). Towards lunch-time Mr. Cheetham promised to lead us to a spot where we could expect to find fresh spring water to wash down our sandwiches. This place proved to be a small ' shake-hole ' at an altitude of about 2,000 ft. on the east side of the mountain. We found here the promised spring and good shelter from the wind and the rain clouds which threatened to descend upon us. After we had finished our lunch Steel started to grub about at the bottom of the damp and grassy side of our shelter for Staphylinid beetles and in a few minutes passed up to me a tube containing a female brachypterous Ichneumon fly which I pronounced to be a *Microcryptus* unknown to me. A search for further specimens was unfortunately prevented by the commencement of the rain, and the descent of the clouds all around us caused us to leave the ' shake-hole ' for the clearer, lower slopes of the mountain.

Some days later this specimen was mounted, together with the other captures of the Horton-in-Ribblesdale visit, and I set about trying to identify the Ichneumonid. I failed to run it down with Morley (1907) and could only confirm my tentative field identification of *Microcryptus* sp. Having occasion, somewhat later, to send some Ichneumonidae to Mr. H. Britten, I included the specimen from Pen-y-ghent. Mr. Britten replied that he did not know anything like it and had failed to find it in Morley (1907). At this time I concluded the species must be a *Micro-*

cryptus not previously recorded from this country, and I commenced to go through such continental descriptions as were available to me. Using Roman's (1909) paper on the Ichneumonidae of the Sarek Mountains, I came to the conclusion that my specimen was either identical with or very closely allied to *Microcryptus terrestris* Roman. There the matter rested for some time, until early in 1944 when my friend Mr. G. S. Kloet very kindly sent me three volumes of the *Ent. mon. Mag.* to complete my series. Whilst looking through Volume 3 (1866-7) I came across Marshall's paper (1867) in which he described and figured *Oresbius castaneus.* I saw at once that the wood-cut agreed very closely with the Pen-y-ghent species, and this was confirmed by a careful comparison with the short descriptions. Thus the Pen-y-ghent insect is *Oresbius castaneus* Marshall, a species which has remained unknown since 1867. It is true, however, that *Oresbius castaneus* was included in the work of Morley (1907), though from description only, and it became a matter of interest to ascertain why both Mr. Britten and I had failed to identify the insect with Morley's book. Another point of interest concerned the relationship of *Oresbius castaneus* to *Microcryptus terrestris* Roman.

Regarding the first point, it is clear that Morley misunderstood Marshall's description. In his key to the genera of the Cryptinae-Phygadeuonini, to which *Oresbius* obviously belongs, Morley (1907: **2**) uses the following character as his primary dichotomy to separate off *Oresbius,* which he thus places at the very end of the tribe:—

(30). 1 Basal abdominal segment not broader at base than apex.
(1). 30 Basal abdominal segment broader at base than at apex .... *Oresbius* Marshall.

The normal and universal condition of the basal abdominal tergite of the petiolate Ichneumonidae is that described by Morley in the first point of his key, in which the segment is narrowest at the base where it joins the propodeum and broadens to a greater or lesser degree towards the apex where it joins the second segment. The reverse, the remarkable character given by Morley for *Oresbius,* would consist of a basal segment which was broader at the propodeal end than at the caudal extremity. That this is not what Marshall intended can be seen by a glance at his figure already referred to. Marshall's description as far as it applies to this point is as follows: 'Segmentum primum triangulare, tuberculis lateralibus nullis, basi latissimum, apicem versus gradatim angustatum . . .', which I take to mean that the basal segment is triangular in shape, broadest at its (the triangle's) base (*i.e.* at the apex of the segment). This interpretation accords

with the illustration given by Marshall and with my specimen. The shape of the basal segment is certainly more broadly triangular than usual, but there is a wide range of variation in this character in the different genera of the Cryptinae, and it certainly has no generic value whatever.

I have recently shown (Hincks, 1944) that *Aptesis* Foerster, 1850, must be used as the valid generic name of that group of species usually known under the genonyms *Pezoporus* Foerster, 1868, and *Microcryptus* Thomson, C. G., 1873. After a careful comparison of *Oresbius castaneus* with *Aptesis nigrocincta* (Gravenhorst, 1815) and allied species, I am of the opinion that these are congeneric and I am therefore placing *Oresbius* as a synonym of *Aptesis* Foerster. The species appears to be a distinct and well characterised one and must henceforth be known as *Aptesis castanea* (Marshall, 1867).

Microcryptus terrestris is well and fully described by Roman (1909: 56) based on specimens of both sexes from the Sarek Mountains in Swedish Lapland. The Pen-y-ghent specimen agrees well with many of the characters of this description, but there are some discrepancies which appear to render its identity with Roman's species unlikely. It is difficult to decide, however, from the single specimen before me which of these differences are to be regarded purely as individual variation. The size of my female is 7·5 mm., which is appreciably larger than the range of 4·5–5·5 mm. given by Roman for *A.* (*M.*) *terrestris*. However, Morley copies the range of size of *Oresbius* from Marshall as 5–8 mm. There are often considerable differences in structural characters between small and large specimens of the same species of many Cryptines, but on the whole it will be best to leave the question of the relationship of *A. castanea* and *A. terrestris* until other material is available.

Aptesis Foerster, 1850, *Arch. Naturgesch.*, **16** (1): 71.

Pezoporus Foerster, 1868, *Verh. naturh. Ver. Rheinl.*, **25**: 181.
Microcryptus Thomson, C. G., 1873, *Opusc. ent.*, **5**: 520.
Aptesis Foerster, Hincks, 1944, *Proc. R. ent. Soc. Lond.*, B.**13**: 32.
Oresbius Marshall, 1867, *Ent. Mon. Mag.*, **3**: 193; Morley, 1907, British Ichneumons, **2**: 3, 108; Schmiedeknecht, 1931, *Opusc. Ich.* suppl., bd. **2**, fasc. xi: 7, syn. nov.

Aptesis castanea (Marshall, 1867) **comb. nov.**

Oresbius castaneus Marshall, 1867, *Ent. mon. Mag.*, **3**: 194 (♀); Sharp, 1867, l.c. **4**: 18; Morley, 1907, British Ichneumons, **2**: 108; Schmiedeknecht, 1931, *Opusc. Ich.* suppl., bd. **2**, fasc. xi: 7.

Marshall originally described this species from two specimens, differing much in size, which he took under stones at the top (about 3,500 ft.) of Garbhavel, near Loch Rannock, in July, 1866. He suggests that it may be a parasite of *Nebria* sp., *Patrobus* sp. or *Otiorrhynchus maurus* (Gyll.), as these were the

only insects of suitable size at the elevation. Later in the year Dr. David Sharp published a short note on *Oresbius castaneus* in which he mentions a female example captured by himself some years before on Goatfell, Arran. No other occurrence of this insect has been recorded up to the present date as far as I am aware. Morley copies Marshall, quoting the distributional data just mentioned. Schmiedeknecht merely copies Morley's data and is misled of course by that author's misunderstanding of the original description.

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Sharp, D., 1867, Note on *Oresbius castaneus*. *Ibid.*, **4**: 18.

Morley, C., 1907, British Ichneumons, **2** (Cryptinae): 108-9.

Roman, A., 1909, Ichneumoniden aus dem Sarekgebirge. *Naturw. unters. des Sarekgeb. Schwed.-Lappl.*, **4**, Zool. Sonderabdruck Stockholm: 47 et seq.

Schmiedeknecht, O., 1931, *Opuscula Ichneumonologica*. Suppl., bd. **2**, fasc. xi.

Hincks, W. D., 1944, Notes on the nomenclature of some British Parasitic Hymenoptera. *Proc. R. ent. Soc. Lond.*, B.**13**: 30-39.

KIMMINSIA BETULINA (Ström) (Neur.) ATTACKED BY ANTS.

By F. J. Killington, D.Sc., A.L.S., F.R.E.S.

On the morning of 29th March, 1945, I noticed a Hemerobiid lacewing emerging from the loose soil at the foot of an apple tree in my garden at Parkstone, Dorset. It had obviously just escaped from its cocoon in the soil, for the wings were minute and undeveloped and raised above the back. Almost at once it was attacked by a *Donisthorpea nigra* (Linn.) worker, which seized it by one of its legs. A second ant joined in the attack and gripped another leg, and the two began to drag their helpless victim over the ground. At this stage I rescued the lacewing and placed it in a tube where it completed its development and did not appear to have suffered in any way from its rough treatment. I was then able to identify it as a male *Kimminsia betulina* (Strøm).

The only other record known to me of an attack by an ant on an adult Neuropteron is that given by Morley (1899, Hym. Suffolk, **1**) and referred to later by Donisthorpe (1915, British Ants: 195). Morley records *Donisthorpea fuliginosa* (Latr.) carrying *Hemerobius stigma* in its jaws.

In America, Smith (1922, *Cornell Univ. Agric. Exp. Sta., Mem.* **58**: 1287–1372) records attacks by ants on the stalked eggs

of Chrysopidae, and states that the ants are able to climb the stalks or bend them over in order to devour the egg at the top.

A NEW LOCALITY FOR *LEUCOPTERA SUSINELLA* Herr.-Schäff. (Lep.).

By S. C. Brown, L.D.S., R.C.S.

This species was first taken in the British Isles by E. R. Bankes at Aviemore, Inverness-shire, in June, 1909, and recorded in *Ent. mon. Mag.*, **46**: 8, 9.

It does not appear to have been found in any other locality in the British Isles.

He remarks: ' The insect was remarkably scarce, and exceedingly difficult to capture, for the aspen bushes, in the very restricted spot where it occurred, were growing crowded amongst a number of young birches, which rendered the use of the net either difficult or impossible.'

He goes on to say that he captured two specimens, which were the only ones he saw.

I paid a visit to this locality in June, 1943, and worked especially for this species without finding it.

However, in an aspen wood on the banks of the river Spey, just outside Grantown, which is about twelve miles north of Aviemore, I captured a few specimens which were flying gently in the sunshine, about two feet off the ground, amongst the aspen saplings. Although so minute, they were quite conspicuous on the wing.

THE LARVAL STAGE OF *NEPTICULA ACETOSAE* Staint. (Lep., Tineina).

By S. C. Brown, L.D.S., R.C.S.

This species, which enjoys the distinction of being the smallest British moth, was figured both in the larval and perfect state by Stainton, Natural History Tineina, Vol. I. This volume was published in 1855.

The mined sorrel leaf shown in his illustration, although in colour, is of natural size, and therefore cannot show the extraordinary workings of the larva.

The microphotographs here shown (Pl. VIII) were done for me by Mr. A. Robins, F.R.P.S., to whom my thanks are due.

The mines were kindly supplied by Mr. S. Wakely from Ashtead, Surrey.

1

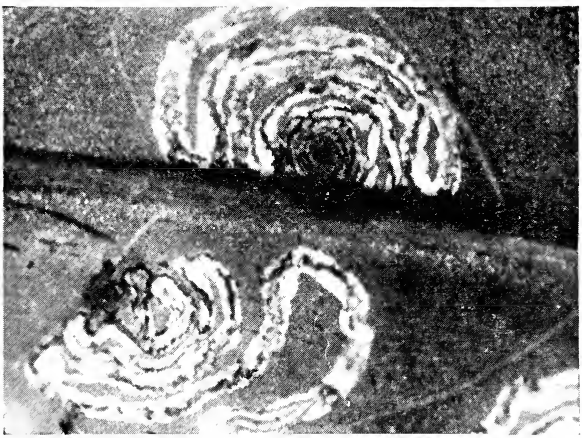

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PLATE VIII.

Figs. 1-3.—*Nepticula acetosae* Staint. Mines of larvae in sorrel leaves. Figs. 2 and 3 enlarged.

EUPISTA (COLEOPHORA) VITISELLA Gregs. and *VACCINIELLA* H.S. (Lep.) IN INVERNESSSHIRE.

By S. C. Brown, L.D.S., R.C.S.

One object of a visit paid to Aviemore in June, 1943, was to look for the *Vaccinium*-feeding Coleophorids. Although many hours were given up to searching the plants for larval cases, only two were found. These two cases, which belonged to two different species, were sent to Mr. H. Stringer, of the British Museum, for identification. He kindly examined them and reported: 'The smaller *Coleophora* case is certainly *vitisella* Gregs., the larger one compares very favourably with *vacciniella* H.S. and may be that species.'

Vitisella is recorded by Meyrick, Revised Handbk., 1928, as occurring in Cheshire, Lancs. and North Ireland. The only British record for *vacciniella* appears to be two examples taken near Buttermere, Cumberland, and recorded by Meyrick, *Entomologist,* **63**: 38.

Although there is a certain amount of doubt about the identification of the latter species, I give the evidence as it stands.

SYMPETRUM SANGUINEUM Müller (Odonata) IN THE SOUTHERN FENLAND.

By R. B. Sims, M.A.

Since it appears that over most of Britain *Sympetrum sanguineum* Müller is a very localised species, I feel it should be recorded that in at least the southern part of the East Anglian Fenland it has been easily the dominant Anisopteran during 1944. I have taken it in relative abundance from a wide range of localities over what is known as the South Level of the Fenland. That is the part of the Fenland basin which lies east of the Bedford rivers between Cambridge in the south and Downham Market in the north. The innumerable large and almost stagnant 'drains,' 'lodes' and other watercourses in this region render it an ideal one for Odonata, though the comparative inaccessibility of large areas in pre-war times has led to its being little investigated.

I first became aware of *S. sanguineum* towards the end of June. During that month the insects all showed the yellowish-brown immature colouring, but towards the middle of July many of the males were observed to have taken on the blood-red of

maturity. The instinct for copulation seemed to have a sudden outburst during the first week in August, when nearly all the specimens I took for identification were so engaged. Before and after that date only a few odd couplings were observed.

By the end of August *S. sanguineum* was becoming scarcer, and was last seen on the wing on 4th September, though a single specimen was swept from herbage beside Burwell Lode on 9th September.

During almost the whole of the period, males were seen in far greater numbers than females. It was only during the short outburst of mating that the latter were seen in any numbers at all. Possibly this indicates that the females are normally much more sluggish than the males, and therefore more likely to escape observation.

The only other *Sympetrum* which I found associated with *S. sanguineum* was *S. striolatum* Charp. Till the end of July this species was vastly outnumbered by the former, but during the last part of August became the commoner of the two. Throughout September and early October *striolatum* was on the wing, though not very commonly, and odd specimens were taken as late as 28th October.

I should add that I am indebted to Lt.-Col. F. C. Fraser for kindly confirming the identity of the *S. sanguineum*.

OBSERVATIONS WITH A POSSIBLE BEARING ON THE PREY OF *CHRYSOPA PHYLLOCHROMA* Wesm. (Neuropt.).

By R. B. Sims, M.A.

As referred to by Dr. F. J. Killington in his 'Monograph of the British Neuroptera,' Withycombe (*Entom.*, **57**: 145-152) records that B. S. Harwood found *Chrysopa phyllochroma* Wesm. to show a definite preference for bean-fields where *Aphis rumicis* Linn. was present. Whilst examining fields of sugar-beet in the fenland west of Ely, Cambs., towards the end of June, 1944, I frequently roused large numbers of imagines of this Chrysopid, sometimes one at every few steps. Many of the fields must have contained dozens of specimens. During July this experience was repeated in many localities throughout the south-eastern part of the Fenland as far north as Downham Market. Towards the end of that month, however, imagines became fewer, though I found eggs of the species in increasing numbers on the beet plants. These were found to be laid singly, on the undersides of the leaves, frequently near their bases, and,

although two or even three eggs were sometimes found on a single plant, there is no evidence that these were laid by the same female. By the end of July in some fields eggs were observed on about twenty per cent. of the beet plants. Only odd imagines were seen in August, the last on 14th August. No search was made for the larvae, though unhatched eggs were scarce after the first week in August.

Although I have collected Neuroptera throughout the county, I have not observed any *C. phyllochroma* away from the close proximity of beet fields. Elsewhere, *C. carnea* Steph. is the dominant and almost omnipresent species outside the more highly cultivated parts of the Fenland.

It is interesting to note that *Aphis fabae* Scop. is recognised as the Aphid of beans and sugar-beet, and that in recent years the Fenland beet crop has suffered from a series of attacks from this pest. The bean race of *A. rumicis* referred to by Withycombe is almost certainly that now generally referred to as the species *A. fabae*. The fact that I have found *C. phyllochroma* so closely associated with beet fields possibly may indicate that under certain conditions its larvae show a marked taste for *A. fabae,* an inference much in accordance with Withycombe's earlier observations.

In a highly arable area such as the Fenland, where there is hardly any unploughed herbage between the fields, save in the ditches which are waterlogged in winter, and the land is almost continuously under a series of crops, it is difficult to understand how a Chrysopid can survive the winter in any numbers. Apparently some special features in the ecological make-up of *C. phyllochroma* allows of adaptation to such an environment. Certainly nearly all the records of the species from Britain indicate that it has a greater propensity for open fields, even when away from cultivation, than any other of our Chrysopidae apart from its closest relation, *C. abbreviata* Curt. Since the latter seems almost confined to sand-dunes it is not liable to overlap *C. phyllochroma* in range.

The taxonomic and ecological relationships of these two species appear interesting from the evolutional standpoint. Apparently their common ancestor was ecologically distinguished from its allies by its association with more open stations and with herbaceous rather than woody plants. Further speciation then found one of the new forms ecologically separated from the other by its preference for the particular sand-dune vegetation niche of their common special environment. It would be interesting to know the extent of correlation of these changes with alterations in any preference for particular prey of the Chrysopidae involved, and what part, if any, such preferences may have played in the speciation of these lacewings.

NOTES ON THE PAST AND PRESENT DISTRIBUTIONS OF SOME ORTHOPTERA IN THE SOUTH LEVEL OF THE E. ANGLIAN FENLAND: WITH A PARTICULAR STUDY OF *TETTIGONIA VIRIDISSIMA* L. AND *CONOCEPHALUS DORSALIS* (Thunb.) (Orthopt., Tettigoniidae).

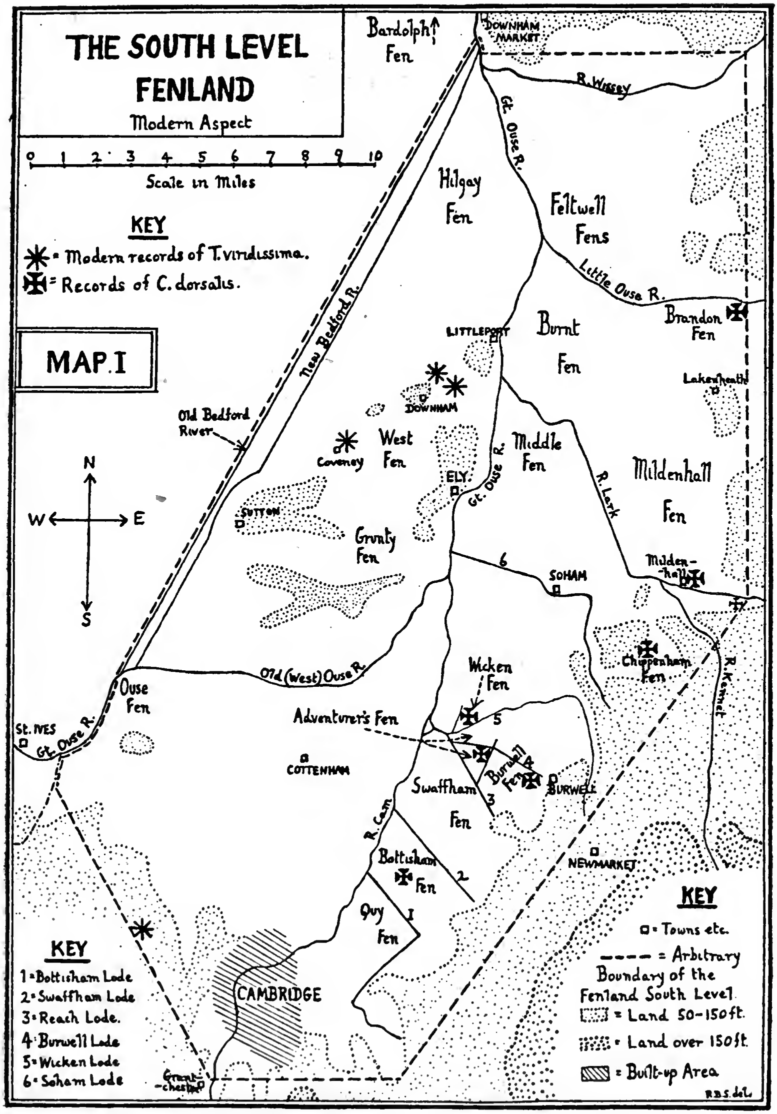
By R. B. Sims, M.A.

Introduction

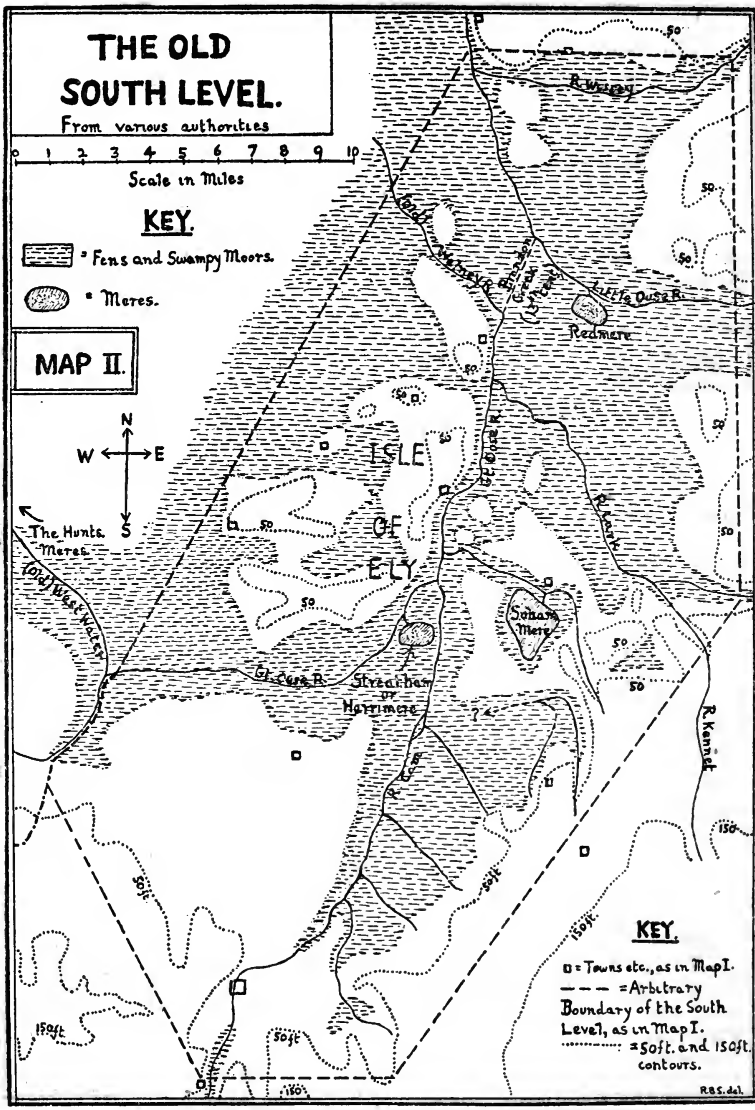
In earlier times, the Fenland basin of East Anglia probably possessed a comparatively rich orthopterous fauna. This would have been more especially true as regards the hygrophilous species, though the 'islands' such as that of Ely, as well as the more elevated ground fringing the Fenland area, would have been suitable for the more xerophilous kinds. It was the great drainage works of the seventeenth century, in causing fundamental changes in the water-level of the Fenland, which really sounded the knell of the marsh-loving species; earlier such operations had but local effects. After this time, the amount of surviving marshland became rapidly less, whilst the consequent increase in the extent and intensity of cultivation, especially as it largely dispensed in the fens themselves with the use of hedges as field boundaries, must have militated against the survival of those Orthoptera of retiring habits, even when marshy conditions were not essential to their existence. With a few relapses this process has been progressively continued up to the present day.

Subsequent to the cutting of the Old Bedford River under the direction of the Dutch engineer Vermuyden, the region of the Fenland lying between that river and the R. Nene became known as the Middle Level, whilst to its south and east, stretching as far as the East Anglian chalk escarpment, lay the region subsequently termed the South Level. It is with the Orthoptera in the latter area that we are here concerned. Forming to-day a perfectly natural faunistic region, it is effectively separated from the rest of the Fenland by the two Bedford rivers, with their associated systems of high embankments, counter-drains and intervening washland.

The portion of this South Level which reacted most slowly to the great drainage was that lying immediately to the north of Cambridge. Standing rather apart from the main part of the level, and possessing an ancient drainage system of their own, these fens did not come greatly within the compass of the works of Vermuyden and his contemporaries. Their 'lodes,' embanked



cuts carrying streams from the neighbouring 'highlands' into the similarly embanked main rivers, were at the most cleaned and improved. Of the exact antiquity and origins of Bottisham, Swaffham Bulbeck, Reach, Burwell and Wicken Lodes, little is



known. Even in the closing decades of the nineteenth century, parts of the fens just west of Burwell, as well as to a lesser extent the more southerly Quy Fen, were still rather marshy and prone to flooding in winter. Environmentally, however, this gave

only a rough approximation to ancient conditions. Indeed, it is probable that soon after the disappearance of the last mere* no wholly unmodified marsh large enough to retain a comprehensive, typical and ecologically stable orthopterous fauna remained in the whole South Level. Even the well-known Wicken Fen has a water-level so altered that its relict fauna and flora no longer represent stable associations, and are preserved only by 'artificial' means; in any case, it was probably always one of the drier types of fen.

After their whole circumstances had become unfavourable, some hygrophilous Orthoptera must nevertheless have lingered for a while. It is a great misfortune that records of the extent and manner of this are so few. Probably no other major region of England has undergone over a comparable period such a marked change (other than urbanisation) as has the Fenland. A study of the effect of such changes on insects so sensitive to environmental conditions as many of the Orthoptera would bear the potentialities of high interest.

Changes in the Orthoptera of the Region

Damp or marshy places elsewhere in Eastern England at the present time maintain the three uncommon species *Metrioptera brachyptera* (L.), *M. roeselii* (Hagenb.) and *Mecostethus grossus* (L.). All these were quite possibly inhabitants of the ancient fens. It is true that the present British records indicate a more or less coastal distribution for *M. roeselii*. This is not the case on the Continent, however, and even should the insect in E. Anglia have been confined to tidal regions in earlier times, it must be noted that the tides were felt far up the original Ouse, and indeed introduced a certain littoral element into sections of the old Fenland fauna and flora. At a still earlier date, even more estuarine conditions applied.

If the *Metrioptera* spp. ever occurred, they had apparently disappeared from the South Level by the mid-nineteenth century. Jenyns, whose knowledge of the Orthoptera of the region during that time was comprehensive, makes no mention of them in his lists.[1] Both spp. are represented in his collection from the Fenland, now in the Cambridge University Museum, but since he did not record any such specimens their true origin is very questionable.

Mecostethus grossus, on the other hand, survived well into the nineteenth century. Jenyns found it 'abundant in the fens around Ely.' He also knew of the species from Burwell and Swaffham Fens, just north of Cambridge—from just the district, in fact, where it might be expected to have lingered. The early

* Soham Mere survived until about 1793, although apparently there exists no account of its drainage. Harrimere was gone by 1860.

record of C. W. Dale from Bardolph Fen, just north of the South Level, is also worthy of mention. When this fine insect became extinct in the region is not even approximately known, though it has certainly not occurred in a number of collections of Orthoptera made during the twentieth century. To-day there are but three or four possible localities in the whole South Level, and in none of these have I found any sign of the species.

The apparent absence of *Pholidoptera griseoaptera* De Geer from the region is of considerable interest and lacking in complete explanation. It is widespread and far from uncommon in most parts of England. Intensive cultivation is not of itself causitive, since I have found it common enough in analogously treated areas of Gloucestershire, from the Severn plain up to at least 800 ft., though most partial to the damper places. In that county, on the other hand, capacious hedges with plentiful undergrowth afford *P. griseoaptera* suitable retreats. In the South Level hedges are very few, and woods even fewer, whilst the neighbouring uplands are typified by their hedges being mostly mutilated remnants.

P. griseoaptera has been recorded quite recently by the Rev. C. E. Tottenham from the Ouse valley, in Hunts., where the fact that undisturbed rank vegetation is more in evidence may be significant.[2] Certainly, on the other hand, this feature is not entirely absent from the Fenland, so that climatic and geological factors may play at least some part in the occurrence of this Tettigoniid. A more detailed knowledge than we at present possess of its distribution throughout Britain is necessary before such points can be cleared up. It is hardly likely that the insect has been seriously overlooked in the South Level. I have always found it with comparative ease where it does occur, whilst its typical and quite penetrating vesperal and nocturnal stridulation is unmistakable. As a control on the silence of earlier records, I have sought the species in many suitable places within the region, but with no success.

In contrast with the absent or extinct Orthoptera, I have found two of the less common British Tettigoniidae during the summer of 1944 to be far from scarce in the South Level. As far as one can gather from the old records, *Tettigonia viridissima* L. and *Conocephalus dorsalis* (Thunb.) may have been more common and widespread here a century ago, but to-day they seem to be still quite well established. Their respective habitats have now undergone comparatively little significant change for at least half a century, and consequently any further changes in the status of these species within the region would be of biological interest, as being ascribable to factors other than direct consequences of the drainage. Also it is interesting to ascertain under what circumstances *T. viridissima* and *C. dorsalis* have been able to survive the great drainage in the Fenland, when

other orthopteran species formerly associated with them in the region have become extinct.

To these ends it is proposed to give a brief summary of the known distribution of these two species within the South Level, along with relevant features of the habitats, and observations on their ecology, habits, and life-history. Other points of interest regarding these insects noticed during the studies will also be mentioned.

Tettigonia viridissima L.

This insect is not usually looked upon as a marsh-lover, and indeed often flourishes on those dry heaths and commons with sufficient rank vegetation. Along with many other frequently xerophilous Orthoptera, however, over some portions of its range, it may be associated with swampy ground. I have found the species abundant in some Bavarian swamps even when it was absent from the adjacent higher ground, and certainly, according to Jenyns, it was common enough over the South Level a century ago. On the other hand, the exact type of haunt frequented by the *T. viridissima* of his records within the actual Fens is not indicated. As we shall see later, there is now some evidence that it may have favoured the drier patches. In any case, it is here worth noting that *Myrmeleotettix maculatus* (Thunb.), in Britain usually typical of dry heaths, is, nowadays at least, widespread in the South Level Fenland, where I have frequently found it in association with the much more generally hygrophilous *Chorthippus albomarginatus* (De Geer) (=*elegans* Charp.).

Until quite recently *T. viridissima* was considered to have become very scarce in the South Level and its environs. Probably, however, this was due to the lack of searching, since, in at least one of the localities where I have recently found it, the insect has been known to the local people for many years. In 1926 the Rev. C. E. Tottenham found it at Coveney, some four miles west of Ely, this being the first record from the Level for about seventy years.[3] Then, in 1935, Mr. G. C. Varley took it at Madingley, on the upland fringe of the Level.[3] Now in 1944 I have ascertained the species to occur in several localities near Little Downham, well to the north of Tottenham's locality and nearer Littleport. It will be observed from the map that in no instance is *T. viridissima* recorded from a site in the heart of an ancient fen. The localities lie either on the upland fringe, or else on the edges of what was once the Isle of Ely proper.

The Little Downham Localities.

The Little Downham localities studied are all intensively cultivated and, bordering on the site of Westmoor Fen, bear scarcely tree or bush. Communications are served by a series of straight 'droves,' which are mud tracks with wide grass verges, sepa-

rated from the ploughed fields on either side by fairly wide ditches. *T. viridissima* was found to be practically confined to the margins of such droves, to certain characteristics of which it seems apparent that the species owes its existence in a district otherwise so unfavourable to a large Tettigoniid.

The salient characteristic associated with the presence of the insect in any particular drove was that of a tall and dense growth of Burdock (*Arctium lappa* L.). The 8 ft. grass margins of many of the droves in this district frequently bear extensive clumps of this large and sturdy plant, and although well over a score of male *T. viridissima* were seen, taken, or heard, only a few were observed outside a Burdock clump. Of these latter, one had wandered a few yards into a beet field to stridulate from the largest leaf of a beet plant, and the others behaved likewise on reeds (*Phragmites vulgaris* Druce) in the marginal ditches.

There are other features of these droves probably favourable to the presence of *T. viridissima*. Untended and perennially undisturbed grassland, nowadays so scarce over most of the Level, is provided by the wide grass verges to the tracks. In such ground the eggs can be laid, to escape the plough, the frosts and the hooves of cattle. In these places it is likely that other insects may have escaped extermination. The seclusion needed by the *viridissima* females, and by immature males, and probably afforded in ancient times by the dense reed-beds of the fen margins, is supplied in the Little Downham localities by the presence in the wide ditches (which are frequently dry in summer) of a rank vegetation, still mostly reeds.

It may be of significance that the focus of distribution of *viridissima* in each drove studied lay near the railway embankment, up to which the droves slope to cross the railway line by level-crossings. Though no specimens were discovered on the embankment itself, their numbers decreased progressively along the droves with distance from this feature on either side. This seems to indicate either that drainage is a limiting factor in the distribution (perhaps affecting the eggs), or else that migration from the higher ground, nearer the Isle of Ely proper, has occurred along the embankment. It was certainly noticeable that the insect was most common in those suitable localities towards the higher ground.

The soil in this district is all of the soft, light and spongy black fen variety, predominantly alkaline in reaction.

Habits of the Species in the Field.

Further observations on *T. viridissima* in captivity (see later) confirmed Chopard's statement that except during short and ill-defined periods the fully developed males exhibit a strong negative geotaxis (or positive phototaxis) and will continue to wander

until this reflex is in some way satisfied.[4] In France this habit often takes the insect on to trees and bushes, though British workers more often mention less elevated situations, such as the heads of thistles. It is on account of this behaviour of *viridissima* that the reason for its favouring the Burdock-lines droves near Little Downham becomes apparent. And it is projected into even stronger light in the wide-open, almost interrupted expanses of the modern Fenland.

The resting position of the males on the Burdock was almost invariably the typical one of stridulation, *i.e.* head downwards. Thus placed, the insect harmonised remarkably well in colour with the varying greens of the plant, and as autumn deepened the colour of the Burdock there came the corresponding change in the tint of the *viridissima*. The camouflage effect was also undoubtedly augmented by the harmony in order of size between the fruit-heads and leaves of the plants and the body of the Tettigoniid.

Besides the cryptic, the mechanical aspect is also of interest. *T. viridissima* would not only be ill-concealed against the small leaves of a hawthorn bush, but with its heavy and rather clumsy body would find locomotion difficult in plants of that kind. The dimension factor of plant-parts must play an important rôle in determining those plants frequented by an insect of this bulk. Possibly to some such feature of the arboraceous flora of the more southern regions of Europe can be ascribed the apparently more arboreal habits of *viridissima* there. On the other hand, the possibility that higher summer temperatures may lead to greater scansorial activities cannot be overlooked.

Owing to their retiring habits, and to the fact that they do not advertise their presence by stridulation, females were only obtainable by intensive sweeping of reeds and long grass. None appeared in the Burdock. Since at no time in any of the localities studied was the mean population density of the males (audible or visible) greater than about one per ten square yards, this difficulty in finding the inaudible and less ostentatious sex is at once explicable. The proportionate numbers of the sexes are consequently only satisfactorily obtainable by breeding.

Stridulation.

The ' song ' of *T. viridissima* is less clear and vibrant than the piping squeak of *P. griseoaptera* or of the crickets, yet is typically Ensiferan. In comparison, the stridulation of our British Acridiidae is a mere industrious rustle. The greater volume of sound, on the other hand, gives the ' song ' of *viridissima* more carrying power than is the case with our other native stridulating Tettigoniidae. Its well-known deceptive qualities were much in evidence. Thus, although the general direction of emanation was ascertainable, the exact location of the insect concerned was

much more difficult to decide. On several occasions I advanced in the direction of increasing volume of sound for twenty yards or so towards a male, meeting with increasing orientation difficulties, and with the increasing impression at every step that the insect was but a yard ahead.

Under reasonably congenial conditions in captivity out-of-doors, the individual males varied considerably in their readiness to stridulate, depending no doubt on age, sexual condition and 'personality.' In such captivity, however, the song was noticed during any of the twenty-four hours, with rather a maximum towards evening and during the first half of the night.

Of the ten males studied, nine were observed to stridulate rather intermittently, with long silent intervals. The tenth, on the other hand, soon became a great favourite. During the thirty-four days of its captivity, this insect stridulated almost incessantly, both day and night, with few pauses except for feeding, up to the very hour of its death. Unlike the other males, this individual would not cease its song on one's approach, and even prodding with the finger often induced only a momentary pause. Being one of the earlier males collected (see later) this insect may have been the only one unmated. Since only fertilised females were available, such as were not expected to, and did not pay any attention to this songster, valid experiments to test this possibility were impracticable. The male in question showed other anomalies in behaviour (see later).

Whilst stridulation may serve a purpose in mating by attracting the attention of the females, it seems almost certainly to play other rôles in the life of the insect. It has often been suggested that rivalry between males gives rise to 'singing-matches.' Again, although this factor may be involved, it is difficult to separate from other causitive stimuli. Fabre observed that after mating (and *T. viridissima* is monogamous), a male will soon be stridulating again as assiduously as ever.[5] One might expect the competitive ardour to have waned by then, as is the case in so many other animals. Moreover, in the complete absence of any other of the species, I have found males to produce undiminished volume of song. In the case of rivalry, a mutual physical hostility might be expected, yet on two occasions have I observed a couple of males stridulating on a Burdock, only about two inches apart. Though carefully watched for nearly an hour in one case and about twenty minutes in the other, they displayed no obvious signs of resenting each other's presence, and finally slowly wandered apart. There seems distinct evidence (see later) that stridulation is a reflexion of the 'emotional' state of the insect, consequently being performed in response to a whole range of stimuli, included in which may be those of mating and of rivalry. Within this category it may also be looked upon as a 'herd'

sound to enable such indubitably vagrant insects to keep together in a particular area, even though too widely spaced for other sensory contact. The colony is thus kept centred around its optimum locality, and the population density prevented from dropping below the level when, for mating, meeting becomes too fortuitous or attraction too difficult. For insects which wander so readily, the strongly colonial propensities of several of our stridulating Ensifera are in need of some such explanation. In the case of the House Cricket, *Gryllulus domesticus* L., I have on several occasions noticed that in such a place as they have never been observed before, the arrival of one stridulator is promptly followed by that of others. If, however, the newcomer is promptly suppressed, there are no successors. One is here tempted to the conclusion that a chance arrival will stridulate on finding a suitable habitat, and that other vagrants passing within ' earshot ' are thus caused to join him. There is no reason to suppose that only males are so attracted, and thus a colony is rapidly built up. The restriction of stridulating powers to the males probably finds a parallel in those many other animals whose males alone perform certain of the more active functions of intraspecific life.

Activity and Length of Life.

Although easily deterred from stridulation, the *T. viridissima* studied in the field were not easily alarmed into movement. A relatively incautious approach usually found them quite leisurely moving away. They could easily be taken in the hand by a quick movement. If lightly touched, however, or if their ever-roving antennae came into contact with a moving part of one's person, a rapid running movement resulted. Almost invariably of short duration, this most frequently took the insect merely to the underside of its leaf, and never further than the nearest conceivable analogous shelter. More vigorous contact caused a sudden reaction, half leap, half flight, by which means a yard or so could be covered without loss of altitude. On one occasion this took a *viridissima* from a 2 ft. Burdock plant on to the writer's coat at elbow level. Such feats would seem to represent the limits of the flying powers of the insect.

In captivity, *viridissima* appeared liable to activity at almost any time, exhibiting no distinct periods of dormancy. If part of their cage was placed quite suddenly in sunshine, a rapid taxis in this direction was evinced, and for a long while the insect would bask in the warmth.

When the species was first discovered on one of the droves near Little Downham on 16th August, 1944, males could be heard stridulating in numbers, and from their condition and activity

appeared to have been not so very long matured. On 6th September a more thorough investigation of the area was made. By that time, though the weather was favourable, the species was less numerous in the original locality. This drove also proved to contain the largest and most densely populated of all the colonies found in the region. The specimens taken on this second occasion all had the appearance of senility. The bodies and elytra showed the more brownish tinge which the earlier-collected males had by then, in ageing, donned in place of their original brighter green, whilst the elytra were in many cases becoming ragged at the tips. In captivity, all the specimens died during the period 18th–24th September, irrespective of their date of capture. Consequently it would appear improbable that many individuals of the Little Downham colony survived into October. Fabre relates the mating of this species in July, and the above observations seem to indicate that *viridissima* in the South Level reaches its culminating activity at any rate not much later in the year. The 'season' for adult *viridissima* is thus distinctly earlier than for most of our other Tettigoniidae.

Feeding Habits.

In captivity, several grasses, including *Phragmites vulgaris* Druce, also *Trifolium pratense* L., *Rumex crispus* L. and *Ranunculus repens* L., were supplied as food, and all of these were to some extent eaten. None of the specimens, especially the later ones, fed at all eagerly, however, being probably all senescent. As is related by earlier writers, *viridissima* proved willing to include insects in its diet. *Musca domestica* L., *Calliphora vomitoria* L., *Chorthippus parallelus* (Zett.) and *C. elegans* Charp. were all devoured, though in no instance was an attack on living prey actually witnessed.[5] The mode of eating grass was carefully observed. After previous inspection by the palpi, the blade was then bent downwards towards the insect, and finally held down by one of the fore tarsi. The tip of the leaf then lay pointing towards the mouth, and a steady forward movement of the head pushed the whole leaf, starting at the apex, gradually towards the mandibles, to be masticated by them, and then swallowed. The whole was part of a smoothly-flowing process, and contrasts with that of *C. dorsalis*, to be described later. Crystalline sugar was much favoured, being 'shovelled' into the mouth by the palpi, and ground between the mandibles before swallowing. If kept with living grass, but in the absence of direct water supply for two days or so, individuals were on several occasions observed to become rapidly aware of droplets of water introduced into their cage, and subsequently to bury their mouth-parts in the liquid for up to two minutes. Under natural conditions it would thus seem that *viridissima* may take 'sips' of dew or rain.

Conditioning.

Of the *viridissima* studied in captivity, the unique male previously mentioned showed a level of 'intelligence' far above that of its fellows. Being kept in a large glass vessel suitably fitted out with a gauze wire top, and the bottom covered with a mixed grass turf, this individual was given a few grains of sugar regularly at 1 p.m. each day. When this food, to which it was greatly addicted, was first discovered, great excitement was shown. Not only were the antennae quivered vigorously, but the insect gave one sharp characteristic stridulation, like a hoarse chirrup. Since on several subsequent such treats exactly the same sound was produced, I have the strongest impression that the chirrup was one of pleasure, or of excitement. In fact, here was an instance of the stridulation used as an expression of 'emotion' quite apart from any mating process.

For the first seven days of captivity, the gauze was touched only when cautiously lifted at a particular corner for introduction of the sugar. For the first three days the insect showed comparative indifference to the raising of the gauze, and a short while later found the sugar more or less fortuitously. On the fourth day, excitement was shown at the procedure, and after about half a minute's rapid wandering the sugar was found. On the fifth occasion the insect had apparently 'learned.' The first movement of the gauze found it across the vessel in a swift rush, and waiting, with vigorously moving antennae, at the corner where the sugar had been introduced on previous occasions. As it took this food the 'emotional' stridulation was again given. On the sixth and seventh days the same behaviour was repeated, and since this seemed sufficiently confirmatory of a true state of conditioning, the sequence of treatment was then broken for other feeding experiments. Four other males were subjected to the same sugar treatment over the identical period without showing any analogous behaviour, a state of affairs which would appear to indicate wide potential differences in behaviour between different individuals of this species. In short, some are much more 'intelligent' than others.

Reproduction.

At 20.0 G.M.T. on 15th September one female was observed actively probing with the ovipositor the turf in her cage. She was quickly removed to another cage in the bottom of which was an inch and a half layer of fine damp soil. By 22.0 G.M.T., however, she was still dragging her rigidly deflexed ovipositor over the ground, so was removed to a further cage containing turf. Within a few minutes the ovipositor was pushed down a crack between the edge of the turf and a side of the cage, and oviposition commenced. It was unfortunately impossible to observe

the actual time of extrusion for each egg, but after four hours the female was in exactly the same position. Next morning she was once more wandering around the cage.

Eighteen eggs were counted in the crevice, and these were of the dimensions: length 5·00–5·50 mm., width 1·30–1·40 mm. When freshly laid they were slightly curved, rather tapering to the apices, and slightly though very convexly triangular in transverse section across the middle. Later they became somewhat flattened, even slightly concave, on two opposite sides of their length, then having the two width dimensions: breadth 0·75–1·00 mm., depth 1·40–1·60 mm. The colour of the eggs at laying was a dark greyish-brown.

The female died two days later, and on dissection was shown to contain twenty-four more eggs. On account of this early death, conclusions from the oviposition behaviour detailed above should, of course, be made with caution. Indications on four points, however, seem to have been evinced:—

(1) Oviposition may not be performed in bare soil of however apparently suitable a consistency. This habit obviously may have a bearing on the distribution of the species in a highly cultivated area such as that studied.

(2) The eggs are laid in soil crevices, the ovipositor not being actively used as a borer.

(3) The eggs are not laid singly, but in groups, possibly quite large ones.

(4) At least forty-two eggs are laid by each female.

Amongst the unlaid eggs, the two nearest the ovipositor were dark grey-brown in colour, whilst their six neighbours inwards from that structure were progressively paler. The rest of the eggs in the body were flesh-coloured, but whilst most of them were plump and rounded in transverse section, those three nearest the top of the ovaries, and therefore the least-developed, showed a marked flattening. Some of the eggs nearest to these latter also showed some flattening.

Conocephalus dorsalis (Thunb.)

Distribution.

This Orthopteran has always been associated with wet places, passing its life amongst the vegetation along river banks and in swampy ground. Indeed, it has almost invariably been caught amongst rushes and reeds. Although *C. dorsalis* appears to be fairly widespread in Devon, and occurs locally eastwards all along the south coast of England, its real metropolis, as far as at present known, seems to be East Anglia. In that part of Britain, especially in Norfolk, suitable habitats are still more common than is the case elsewhere.

In view of its mode of life and its oviposition habits (see later), there is every possibility that *C. dorsalis* was one of the most characteristic Orthoptera of the ancient Fenland, both in the damp *Eriophorum* and *Juncus* moors and in those wetter true fens over which water did not lie for too long a period of the year. Such features were greatly in evidence over the South Level, but owing to the fact that it is not at all an easy insect to find, we should hardly expect it to figure largely amongst the captures of the early entomologists in the region. Nevertheless, we find Babbington's record of 'Cambridge' mentioned in Stephens' 'Illustrations' of 1835,[6] and we have it from Jenyns that the insect occurred in Burwell and Bottisham Fens, several decades later.[1] Its status further north during those earlier times is quite unknown.

During the more modern period, we hear of it from Wicken Fen and Chippenham Fen (Porritt), records not surprising in view of the 'relict' nature of those localities. From the still-existing marshes along the River Lark came the specimens now in the Cambridge University Museum (Perkins), and from the nearby Tuddenham Fen we have the captures of C. Morley.

From these records comes a strong indication that *dorsalis* has the means still of surviving in localities over the South Level where even small areas of marshy ground still exist. With this in view, investigations on the species have been carried out in the region during 1944, two aspects having been specially considered. Firstly, as to how many of the small marshy areas still to be found in the South Level actually support the species, and secondly, as to what features of the habits and life-history of the insect render its present localities suitable for the survival. The results have been interesting.

In view of the early records of Jenyns, the fens between Cambridge and Wicken have been searched. Although it was not found south of Reach Lode (see map), the difficulty of searching the various watercourses renders the existence of *dorsalis* in an ancient locality there, such as Bottisham Fen, still not impossible. Along the lodes and drains of Burwell Fen, almost into Burwell itself, the insect was found not at all uncommonly, and captures along the cross drain between Burwell and Reach Lodes indicate there to be no apparent reason why its range should not extend to the margins of the latter watercourse, even though none could be found along that portion nearer Reach village itself. The distribution of *dorsalis* was also traced westwards, and specimens taken in Adventurer's Fen, where, however, occurrence was patchy, and the range of the species could not be traced as far as the R. Cam, nor shown to be continuous with the colony in Wicken Fen.

The comparatively recent captures from the isolated fen at Chippenham and the small river valley fens around Mildenhall

called for further investigation of the status of the species along the eastern edge of the South Level. Success was achieved in the corresponding river valley fens to the northward, where I found *dorsalis* to occur in Brandon Fen, a small eastern extension of the Fenland into the Little Ouse valley. This marked extension of the range of the Tettigoniid leads to conjecture as to whether analogous localities near the R. Wissey would prove equally fruitful, but unfortunately war-time travelling restrictions proved prohibitive. Attempts to discover the species elsewhere in the South Level were not successful, so that whether it extends west of the Cam—Ouse water-line is rather doubtful.

We now possess interesting information regarding the distribution of *C. dorsalis* in the South Level. Lacking any evidence of a recent recolonisation by the species, there is a strong indication that *dorsalis* is as firmly established in the fens west of Burwell as it was during the time of Jenyns, nearly a century ago, whilst it also occurs in a number of suitable places along the extreme eastern edge of the Level. The biological significance of this is difficult to assess. For one thing we know very little of its original distribution in the Fenland, whilst furthermore it is an undoubted fact that the marshy patches in the eastern river valleys have retained on their own very small scale a practically unmodified aspect right from ancient times. Moreover, it has been mentioned previously that the fens around Burwell appear to have reacted less quickly to the Great Drainage than those elsewhere in the main part of the Level. *C. dorsalis* may therefore have been always restricted to the extreme eastern part of the Fenland, whilst on the other hand the fact that it is now so confined may be due to the greater favourability of the present habitats in that region.

Habitat Features.

The specimens captured in the district west of Burwell were all swept from the long grass on the banks bordering water-courses. Such situations cannot be described as swampy or even particularly damp, since the lodes and drains, as elsewhere in the Fenland, usually have their banks of clayey materials, and raised well above the general fen level. The species was by no means confined to the immediate proximity of water, though distances of more than twenty or thirty feet from it are practically forbidden to the insects on account of the incidence of ploughed fields. The water edges are lined with *Phragmites vulgaris* Druce and *Juncus effusus* Buch., but in this plant zone no *dorsalis* could actually be detected. Amongst the long grass, isolated tufts of *Juncus glaucus* Ehrh. occurred, but the distribution of *dorsalis* could be in no way correlated with that of these tufts.

In Brandon Fen, all the examples were found by sweeping the dense growth of *Carex* spp. which is found in the uncultivated,

sometimes rather isolated, boggy patches, often a hundred yards across. In no instance were specimens taken from the occasional tufts of *Juncus,* nor from the areas bearing reeds or *Epilobium.*

The great difficulty in finding *dorsalis* by a visual search of its habitats rendered observations on its behaviour there almost impossible. Those specimens actually seen *in situ* were leaping and running actively about amongst the grasses or sedges, probably in alarm at my approach. It is worth noting that although in the places investigated numbers of the insects were taken by sweeping (mostly to be released again, apart from a few check-specimens, after identification), hardly any were damaged by this process. Although this experience runs contrary to that of some earlier writers, *dorsalis* seems to me far less fragile and easily damaged than is generally believed.

Habits.

In spite of listening both in sunny and in showery weather, in such places as I have known the species to be present in numbers, no stridulation of *dorsalis* has ever been observed. Moreover, none of the males, which were kept in a perfectly healthy and lively condition in captivity over a period of up to sixteen days, appeared to make any significant movements of the stridulating region of their elytra. On the other hand, both sexes emit a very distinct, unpleasant odour, strongly reminiscent of that of *Blatta orientalis* L. Possibly, then, some of the biological aspects of ' song ' are in *dorsalis* subserved by an attracting odour, though on the other hand this may act as a repellant to potential predators.

In captivity, the insects showed no rhythm in behaviour to correspond with the time of day, nor any particular response to photic changes. If disturbed, they proved capable of considerable grasshopper-like leaps of up to a foot, and could also run very nimbly amongst even the most spindly vegetation. Ordinarily they spent much of their time resting head upwards about three-quarters of the way up the stems of *Juncus glaucus,* which were planted in their cages. On these occasions they frequently took up the cryptic pose, with legs stretched out nearly straight in front and behind, described by previous writers. Sometimes they were observed wandering quite slowly amongst the grasses and rushes or on the sides and top of their cages, and not infrequently rested for periods, almost invisible, amongst the bases of the plants.

When supplied only with *Juncus,* this plant would be eaten, but in the presence of grass it was never touched. An individual caused to fast entirely for several days was afterwards observed eagerly to inspect and reject several *Juncus glaucus* stems then supplied, before coming upon a young stem of grass upon which it then fed greedily for over an hour. The young and juicy stems

of several grasses were generally preferred to the leaves in the case of all the specimens, and the broken tips of such stems were especially favoured. No suitable living plants of *J. effusus*, a more juicy species than *glaucus*, nor of *Carex* spp. were available for feeding experiments.

The mode of feeding contrasts with that of *T. viridissima*. When the hungry *dorsalis* had inspected an upright grass stem and found it suitable, the insect with jaw movements half masticating, half tearing, would detach a lump of the grass tissues sometimes a third of the size of its own head. Withdrawing its head somewhat from the stem and dexterously manipulating the lump in its palpi, the insect would then hold it against the mandibles for steady mastication and swallowing. The lump disposed of, the process was repeated until the animal's hunger was satisfied.

Oviposition (fig. 20) and the Eggs.

On oviposition habits in the case of several females a number of observations have been made. The most complete series of these were upon a female first seen laying on 12th September. At 13.30 G.M.T. the insect was seen to be tearing with its jaws a hole in one side of a fairly stout stem of *J. glaucus* at about a quarter of its length from the (partly withered off) tip. After five to ten minutes, when a very ragged incision had been effected, the insect crawled up the stem, to sit above the hole, the end of its abdomen being then over the hole. Keeping the head and anterior part of the body close to the stem, the hind part of the body was raised and coincidentally, the ovipositor was deflexed till, when at less than 90° with the body, its tip rested against the hole. A dropping of the body and straightening of the ovipositor then drove the latter through the hole and downwards into the hollow of the stem. In this position, the insect lay in apparent quietude apart from the delicate antennal movements for about thirty-five minutes, during which time the egg must have been laid. By a more or less reversed process to the insertion the ovipositor was then withdrawn, and the insect began a period of rest near the top of the rush, the whole oviposition having taken just about an hour.

By 21.30 G.M.T. six incisions were counted, four on separate stems and two of them on a fifth rush about 2 cm. apart, and subsequent dissection of the rushes showed that a few millimetres below each incision lay an egg. Each of the eggs rested in the hollow cavity of the rush, in some cases against the top of a pith septum. In three instances the ovipositor had very neatly pushed its way through such a septum to lay the egg in the cavity below; after withdrawal of the ovipositor the soft septum-pith had moved back into position completely to enclose the egg in the plant cavity. A striking feature of the whole operation was its per-

formance with the minimum of damage to the rush; indeed, so that in every case the stem continued to live and grow with undiminished virility. That the smallest possible incision is made by the insect is evidenced by the fact that another ovipositing

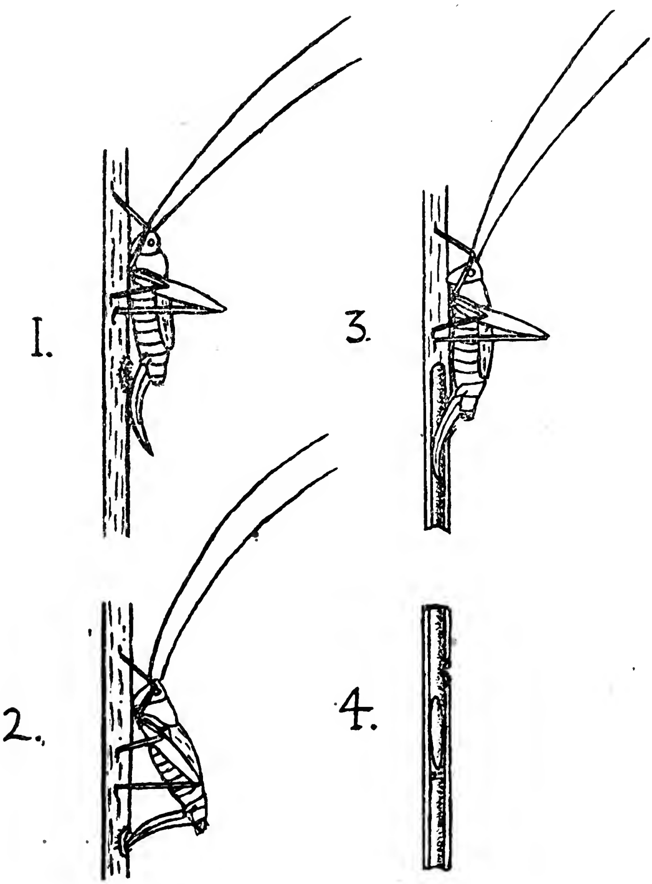


Fig. 20.—Oviposition of *C. dorsalis* in *Juncus glaucus*.

female on another occasion was seen attempting to insert its ovipositor into an incision not yet sufficiently large. The failure caused the insect to crawl down the stem again in order to enlarge the tear before making a fresh, and this time successful, attempt.

After depositing her six eggs on 12th September, the female first described continued her normal mode of life until 17th September, when she laid six more in similar fashion during the afternoon and evening. On 23rd September a further six eggs were disposed of, and when she died on 26th September an opening of the abdomen showed completely empty ovaries.

Over the period 18th–26th September four other females deposited eggs in *J. glaucus* stems, and relevant data concerning them can be tabulated as follows:—

Female No.	Oviposition date	No. of eggs	Died
1 ...	18th Sept. ...	6 ...	20th Sept.
2 ...	21st ,, ...	5 ...	23rd ,,
3 ...	25th ,, ...	6 ...	27th ,,
4 ...	26th ,, ...	4 ...	27th ,,

Since it is obvious that these examples had laid most of their eggs before capture, these figures must be less significant than those for the first female. The lower number of eggs per batch in the case of Nos. 2 and 4 may easily be due to senescence and the fact that the recorded batch represents the last of several.

In the case of No. 2, one observation is worthy of note. In the stem below one of the incisions, two eggs were found. One of these lay at the extreme limit of reach of the ovipositor from the incision, the other with its uppermost end lying only 1 mm. from the lower limit of the incision. Whether this instance can be attributed to an unusual economy of labour on the part of a weary and aged female, or whether under some circumstances or in other plants than the *Juncus* supplied, serial laying is the usual thing with this species, only further observations can tell. As many as three incisions, each with an egg, on the same rush was once recorded, however, whilst the total five females on three separate occasions made dual oviposition in a stem. Subsequent dissection showed the abdomen on death to be completely devoid of eggs in all cases.

Although the female *dorsalis* studied in captivity all laid their eggs quite readily in *J. glaucus,* it is considered quite possible that the softer *J. effusus*, which grows commonly along the water margins in the more southerly South Level localities, would prove at least equally suitable. The fact that no oviposition has been performed in grasses during these investigations seems to rule out the use of these by the insect. Neither positive nor true negative evidence is available concerning *Phragmites vulgaris,* though newly-plucked stems of this plant were not favoured. On the other hand, the presence of *dorsalis* in numbers amongst *Carex* on Brandon Fen, near Lakenheath, in places where *Juncus* was

practically absent, leads to a suspicion that *Carex* may also be utilised to contain the eggs. This would not be impossible in these plants, which, like *Juncus*, possess some of the characters of evergreens and have, especially near their bases, large central tissue-spaces.

To summarise, it can thus be concluded that *C. dorsalis* deposits at least eighteen eggs, and probably many more, in batches of usually six at a time, in the stems of certainly *Juncus glaucus* Ehrh., probably of other *Juncus* spp. and possibly in other plants of similar structure. Usually one egg is laid per rush, occasionally two or even three, and the laying of each batch takes a considerable part of the particular day. Intervals of about five or six days intervene between the laying of each batch, and the females die on the first or second day after completing their oviposition.

The following particulars are recorded of the eggs obtained:—

Shape in longitudinal section: elongate, slightly curved, tapering at both ends.

Length: 4·5–5·0 mm. Breadth: 0·7–0·8mm.

Colour: flesh colour.

Subsequent to laying, no real change occurred in either colour or shape of the eggs when kept in a moist atmosphere for at least two months. After a fortnight a few of the eggs became markedly flattened, and then concave, on opposite sides. It was suspected, however, that these eggs were non-viable, since the great majority have remained as plump as ever to the time of writing. Many have been left in the *Juncus* stems with a view to possible further breeding of the species.

Relationship of Distribution to Habits.

Until we have a more detailed knowledge of the habits and life-history of those hygrophilous Orthoptera which have now disappeared from the South Level, it is difficult to venture an explanation of their extinction when *C. dorsalis* still occurs in quite a number of suitable localities. It is suggested, however, that something in oviposition habits and/or development of the eggs may afford a clue to the problem.

The following features associated with the biology of *C. dorsalis* seem to account for its survival and condition its habitat in the Level:—

(1) The species is not as retiring in habits as many other Tettigoniidae, so that the comparative lack of hedgerows, dense undisturbed vegetation, or inaccessible bushy areas, is no particular disadvantage. This fact is probably attributable to—

(2) The comparatively slender form, rather attenuated shape, habit of adopting a cryptic pose, and matching green colour, render the insect well hidden from enemies in the visual monotony of the rushes, grasses and sedges amongst which it lives, whilst it does not readily betray its presence by leaping, as do grasshoppers.

(3) The endophytic oviposition in *Juncus,* and possibly in other similar monocotyledonous plants, gives the insect at least the potentiality of passing the whole of its life in such localities which are waterlogged or even partly flooded for at least much of the year, and being thus inaccessible to many possible enemies. On the other hand, this oviposition habit renders grazing by herbivorous mammals, especially cattle, very harmful to the insects' existence. Indeed, in many such apparently suitable localities as were obviously on occasions grazed by cattle, *C. dorsalis* was never found. Its localities on Brandon Fen showed no sign of having been grazed, and in fact, being 'relict' patches left over, so to speak, in corners of large arable fields, it is unlikely that cattle would be turned on to them.

Comparative immunity from grazing is also true of the localities west of Burwell, and the fact that *dorsalis* was here found amongst grasses of a not particularly hygrophilous association seems to indicate that under such immunity it may extend its range into places more typical of *Conocephalus fuscus* Fabr.

(4) The offensively odoriferous substance secreted by *C. dorsalis* may render it distasteful to predators in a way that many other Orthoptera are not. This may have given the species an advantage over the now extinct forms under changed conditions of competition after the drainage. Observations, however, are naturally needed on such a point.

Season of Activity.

During visits to the Burwell region on 9th and 20th September, only adults were taken, mainly of the female sex. From subsequent observations in captivity these were all shown to be nearing the end of their oviposition period, or even past it. The comparative scarcity of males probably indicates that these were mostly dead by this time.

The specimens taken on Brandon Fen on 16th September were about 65 per cent. females, and though one female nymph about two-thirds grown was included, all the rest were adults. All save one of the adult females proved to be near the end of their oviposition period, or laid no eggs at all in captivity.

When kept in breeding cages those Burwell region males which were retained died between 23rd and 27th September, whilst the females all died over the period 19th to 24th September. From Brandon Fen, the males died between 22nd Sep-

tember and 2nd October and the females between 20th and 29th September. Although all efforts were made to rear the nymph, it died on 4th October, though whether this was due to uncongenial conditions or to an inherent weakness to which its backwardness in development was also due, is uncertain.

The localities west of Burwell were visited again on 8th October, and a further search of Brandon Fen was made on 15th October, but in neither case could *C. dorsalis* be detected. We can therefore conclude that the evidence in captivity is supported by field observations, and that although there may be slight local differences, the season for *C. dorsalis,* at least in the South Level, concludes about the end of September. We see that this is considerably later in the year than that of *T. viridissima,* though very appreciably earlier than for the widespread and notoriously late member of the same family, *Meconema thalassina* (Fabr.), which is active in this country until well into November.

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NOTES ON THE REARING OF *SYMPETRUM DANAE* (Sulz.) (Odon.).

By S. E. Hall

This species was seen in large numbers, flying per cop., on 18th August, 1943, at the Black Pond, Esher, Surrey. I caught a pair, and the female at once extruded a number of eggs into a glass tube of water. These I put into a dish containing water to a depth of two inches and mud to a depth of a quarter of an inch, and covered with a sheet of glass. The dish was placed in an unheated incubator, kept in an unheated greenhouse.

Once during the winter a little ice was formed around the edge of the dish. As the eggs were so small, I was unable to find and examine them from time to time.

On 11th April, 1944, four naiads hatched out, looking like specks of dust in the water, as they were so minute. Eventually eleven naiads were hatched in all, and were transferred to separate dishes. At first they were very difficult to find in the mud, so that I could not record the growth individually, but one naiad measured 2 mm. on 27th April, another 3 mm. on 21st May, and another 7 mm. on 20th June. This last naiad had grown to 15 mm. by 11th July, with well developed wing-cases. It was on the point of emergence on 28th July, being then 16 mm., when it died.

The average length of eight of the others was 11 mm. on 11th July, each with rudimentary wing-cases, the remaining two measuring 5 mm. and 6 mm. respectively. These eight each measured 15 mm. on 21st July, their wing-cases showing very rapid growth.

On 31st July, 1944, a male emerged, another male and a female on 7th August, 1944. The remainder died just prior to emergence.

In short, the egg stage covered thirty-four weeks, and the life of the naiads seventeen weeks only. They were fed at first on *Paramecium*, then on *Daphnia pulex* until 11th July. Subsequently I gave them a few mosquito larvae and Enchytraeidae.

In 'The Aquatic (Naiad) Stage of the British Dragonflies' (1930) Lucas records a few of this species hatched out 'apparently about the end of January 1901,' from a few eggs obtained on 8th September, 1900.

SOME RECORDS OF TABANIDAE (Dipt.) FROM BERKSHIRE, HAMPSHIRE AND DORSET.

By Capt. E. Rivenhall Goffe, R.A.O.C. (retd.)

In a recent interesting letter from Dr. W. J. Arkell the following records and observations of Tabanidae occur, and may be of interest to those studying the family:—

T. sudeticus Zell.—I have 2 ♂♂ and 9 ♀♀ of the form *meridionalis* Goffe from Wellington College, Berks, 1918-21. The species was quite common there.

T. bovinus Linn.—I did not meet with this species myself, but I refer to it 1 ♀ which my brother picked up dead at Wellington College.

T. solstitialis Meig.—In four years' collecting at Wellington College I only took 1 ♀ of this species.

T. distinguendus Verr.—Abundant. A number of males were taken at Wellington College.

T. paganus Fabr. and form *bisignatus* Jaenn.—I consider this to be the commonest of the larger Tabanids in this area; it occurs regularly even in my garden here [Cumnor]. I have also a series of males.

T. nigrifacies Gob. (*latistriatus* Verr., Goffe, *nec* Brauer).—I took 5 ♀♀ near Studland, Dorset, on 20th July, 1923.

C. caecutiens Linn.—I have everywhere found this to be the commonest species of *Chrysops*, and have never been able to substantiate the remark of Verrall (1909: 428) to the contrary. It occurs in my garden here [Cumnor] every summer, and I have also taken numbers of males. The var. *nigrescens* Goffe occurred at Fleet, Hants., 11th June, 1921, and the var. *obsolescens* Goffe at Wellington College on 17th June, 1921.

C. quadratus Meig.—I found this species in some numbers at Hartland Moor, near Arne, Dorset, on 10th August, 1922. Besides the type form my captures included the forms *intermedius* Goffe, *pictus* Meig. and *lineatus* Goffe.

C. relictus Meig.—I have only met with this species at Hartley Row, Hants, in July, 1921. The 2 ♀♀ taken were both the type form.

C. sepulchralis Fabr.—I took 10 ♀♀ of this species near Studland, Dorset, in August, 1921.

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INTERNATIONAL RULES OF ZOOLOGICAL NOMENCLATURE.

By CAPT. E. RIVENHALL GOFFE, R.A.O.C. (retd.)

Those entomologists who do not possess a copy of the International Rules, and who do not wish to wait until the promised re-issue becomes available, may like to know that they can obtain a copy in a useful little book entitled *Procedure in Taxonomy*, by Edward T. Schenk and John H. McMasters, Stanford University Press, California, U.S.A., and Oxford University Press, London, 3rd December, 1935.

This is obtainable through any bookseller from the Oxford University Press, London, for about 13/6, and contains as an appendix a complete copy of the Code of Rules, together with a summary of all Opinions rendered up to and including No. 133—the last one to be issued in America prior to the transfer of the Secretariat of the Commission to London.

NOTE ON THE TYPE-SPECIES OF SOME GENERA OF SYRPHIDAE (Diptera).

By CAPT. E. RIVENHALL GOFFE, R.A.O.C. (retd.)

(*a*) GENUS *PARHELOPHILUS* GIRSCHNER, 1897

In a recent paper (Goffe, 1944b: 129-30), when referring to this generic name, I stated that no species had been designated as the genotype, and I selected *Syrphus versicolor* Fabr., 1794, the second of the three species included by Girschner, as the type-species. I now find that I had overlooked the fact that Curran and Fluke had named *Syrphus frutetorum* Fabr., 1775, the first of Girschner's included species, as the genotype of *Parhelophilus* in 1926, *Trans. Wisconsin Acad. Sci.*, **22**: 230. This designation is valid, and therefore takes priority over mine. As the two species concerned, *frutetorum* Fabr. and *versicolor* Fabr., are considered to be congeneric, the change of genotype does not affect the sense in which this generic name is being used.

I much regret that I had somehow failed to record this designation, and I am most grateful to Dr. C. L. Fluke for drawing my attention to it.

(*b*) Genus *Neoascia* Williston, 1886

The type-species of *Neoascia* Williston, 1886, is stated by Coquillett (1910: 574) to be *Ascia floralis* Meigen, but he does not give any authority for this statement and I have not been able to trace one.

Neoascia was proposed by Williston in 1886 as follows:—

Neoascia nom. nov.

Ascia Meigen (non Scopoli), Syst. Beschr. iii, 185, 1822.

There followed first a generic description and then the descriptions of two American included species, *globosa* Walker and *distincta* n.sp.; whilst two further species, *albipes* Bigot and *metallica* Williston, since recognised by Curran (1925) as distinct, were included as varieties of *globosa* Walker. I have never seen it suggested that any of these species are synonymous with *Ascia floralis* Meig., and Williston did not name any species as the genotype.

It is, however, quite clear that *Neoascia* was proposed by Williston as a new name for *Ascia* Meigen, 1822, on account of its being a homonym of *Ascia* Scopoli, 1777, and it is therefore a case where the selection of a genotype is governed by Article 30 (*f*) of the International Rules:—

> In case a generic name without originally designated type is proposed as a substitute for another generic name, with or without type, the type of either, when established, becomes *ipso facto* type of the other.

As Williston did not designate a genotype for *Neoascia,* and a genotype for *Ascia* Meigen, 1822, had been validly established by Westwood in 1840, the type of *Ascia* Meig. becomes *ipso facto* the type of *Neoascia* Will. also.

The valid genotype of *Neoascia* Williston, 1886, is therefore *Syrphus podagricus* Fabr., 1775, by designation of Westwood, 1840 (for *Ascia* Meigen, 1822, *nec* Scopoli, 1777), under Article 30 (*f*) of the International Code.

The genotype of *Ascia* Meigen, 1822, is correctly given by Coquillett (*op. cit.*, 510) as *Syrphus podagricus* Fabr.

As the two species concerned, *podagricus* Fabr. and *floralis* Meigen, are considered to be congeneric, the application of the generic name *Neoascia* remains unchanged.

(*c*) Genus *Brachyopa* Hoffmannsegg (in Meigen, 1822)

When publishing this generic name for the first time in 1822 Meigen named six included species, the first of which was *Musca conica* Panzer, 1798. In 1840 Westwood designated this species as the genotype.

Musca conica Panzer, 1798, was, however, a homonym of *Musca conica* Gmelin, 1790, and has never therefore been available for use under the Rules.

Musca testacea Panzer, 1798, is quoted as a synonym of this species by a number of authors, and is so given by Kertész, 1910, in *Catalogus Dipterorum*; but the venation of Panzer's figure for *testacea* is not that of a Syrphid, being apparently a species of Muscidae, whilst the name *Musca testacea* Panzer, 1798, appears to be a homonym of *Musca testacea* Degeer, 1776, and in that case is equally unavailable under the Code.

As no other trivial name appears to be available for this species, I propose the name **Brachyopa panzeri** *nomen novum* for *Brachyopa conica* (Panzer, 1798) = *Musca conica* Panzer, 1798, *nec* Gmelin, 1790.

The genotype of *Brachyopa* H'segg. (in Meigen, 1822) is therefore *Brachyopa panzeri* Goffe, 1945 (as *Musca conica* Panzer, 1798, *nec* Gmelin, 1790) by designation of Westwood (1840: 137).

(*d*) Genus *Metalloeristalis* Kanervo, 1938

In a most interesting paper on the western palaearctic species of the genus *Eristalis* Latr., 1804 [=*Tubifera* Meigen, 1800] Kanervo separates our species *Lathyrophthalmus aeneus* (Scopoli) = *Conops aeneus* Scopoli, 1763, from the remaining species of *Lathyrophthalmus* Mik, and proposes for it the new sub-genus *Metalloeristalis*.

Unfortunately, however, Kanervo has overlooked the fact that *Conops aeneus* Scop. is the genotype of *Lathyrophthalmus* Mik, it being the only species included by Mik when raising the genus in 1897. Kanervo should therefore have retained Mik's name for *aeneus* and given the new name to the other species.

As the matter stands at present under the International Code *Metalloeristalis* Kanervo, 1938, being a monotypical genus with *Conops aeneus* Scopoli, 1763, as genotype, falls as an absolute synonym of *Lathyrophthalmus* Mik, 1897.

Summary

The genotype of *Parhelophilus* Girschner, 1897, is shown to be *Syrphus frutetorum* Fabr., 1775, by subsequent designation of Curran and Fluke, 1926, and not *Syrphus versicolor* Fabr., 1794, as designated by the writer in 1944.

The genotype of *Neoascia* Williston, 1886, is shown to be *Syrphus podagricus* Fabr., 1775, under Article 30 (*f*) of the International Code, and not *Ascia floralis* Meig., 1822, as stated by Coquillett in 1910.

Brachyopa panzeri is proposed as **nomen novum** for *Musca conica* Panzer, 1798, *nec* Gmelin, 1790, the species being the genotype of *Brachyopa* H'segg. (in Meigen, 1822).

Metalloeristalis Kanervo, 1938, is shown to be an absolute synonym of *Lathyrophthalmus* Mik., 1897.

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CHLOROCLYSTIS DEBILIATA Hb. (Lep.) IN HAMPSHIRE.

By Wm. Fassnidge, M.A., F.R.E.S.

So far as I know, there is but one record of this species in Hampshire, namely, one specimen taken by Brig.-Gen. Cooke in the New Forest in 1931. As the food-plant, *Vaccinium myrtillus* L., occurs so commonly near Cadnam in the New Forest and in the woods by the Roman road north of Southampton, this is rather surprising.

On 15th April, 1945, I collected spun tips of bilberry, taking all larvae seen indiscriminately. The food-plant was then just coming into leaf and beginning to flower. On 18th April I again collected larvae in the bilberry tips, but had no further opportunity owing to illness. From the larvae thus collected I bred seven specimens of *C. debiliata*, which emerged from 16th to 20th May.

This was an early season, but, even allowing for this, these dates seem to be early, and no doubt I have missed this pug in earlier years because I collected larvae from bilberry too late. All my authors give April and May for the larvae and June for the moth. It is a pity that I could not go searching for imagines in order to find out the date of emergence this year in nature.

One word of warning: bred specimens have a lovely greenish-grey sheen, which is destroyed by keeping more than a few hours in the relaxing tin, giving rise to a bone-grey form that looks as if it had been in the cabinet for years. Killing properly with ammonia does not affect this greenish tinge.

Meyrick gives the known range as Surrey to Devon, Staffs., Lancs., Aberdeen, S. and W. Ireland, Central Europe to East Siberia. It is recorded from widely scattered localities in France. Probably it occurs wherever the food-plant is common.

BIONOMIC NOTES ON A COLONY OF *ZYGAENA FILIPENDULAE* L. (Lep.).

By G. D. Hale Carpenter, M.B.E., D.M., F.L.S., F.R.E.S.

During the early summer of 1943 adult larvae or cocoons of *Zygaena filipendulae* L. were collected from a colony in Berkshire, on Cumnor Hill, just outside Oxford City: the purpose was to obtain some estimate of the population and of its parasites. The colony occupied a large area, and I selected a piece of rough grassland of approximately one-quarter of an acre and a strip of roadside grass verge measuring about 100 x 2 yards: total area about 1,410 square yards. Having no time to search for immature larvae, I limited myself to collecting cocoons and fully-fed larvae about to spin. I noticed then that birds with fledgling young tore open the cocoons and extracted the contents (Carpenter, 1943) and in 1944 paid further attention to this point (Carpenter, 1944). During the present summer attention has again been paid to this interesting question, with the following result:—

Between 18th May and 14th June, 1945, I noticed the fate of cocoons on the wire fence bordering the grass verge, which could be easily watched on my daily passing to and fro. Unfortunately I had no time to spend in searching for cocoons on grass stems as controls. Not one of the twenty-five larvae that spun up on the fence survived: twenty-three had been removed either at once or after a second pecking open of a cocoon previously damaged and repaired; two had been fatally injured and left undevoured. On the morning of 21st May two freshly completed cocoons had been opened; the contents were not damaged. In the evening of that day one was still unrepaired, the other repaired. The former was also repaired by next morning but by the evening it had been opened again, showing the pupa this time; it was removed on 27th May and the other was also taken. I noted also one cocoon at a point two feet high on a strong grass-stem, not

within reach of any firm perch; it had been opened and the contents extracted. It was probably the work of a light bird such as a tit, clinging to the grass-stem, which was not bent or broken. The colony contained a very few *Z. lonicerae* Esp., in the proportion of five to 1,310 *filipendulae*: I am indebted to Mr. W. H. T. Tams for examining genitalia and settling this point.

The stems carrying cocoons or larvae about to spin were planted upright in sand at the bottom of large tin breeding cages, the open tops of which were covered with several layers of dark green gauze, and with a hole near the top of one side plugged by the neck of a small bottle projecting outwards towards the light, into which the imagines mostly found their way. The difficulty of mould growing in the darkness was countered by using strong salt solution to moisten the sand, a hint which I owe to Mr. R. L. Ford.

Many moths, and a few parasites, failed to enter the bottles and were eventually found dead and, in the case of the moths, crippled, at the bottom. At the end of the summer the containers were opened, all empty cocoons were removed, and the dead imagines counted: these are the class 'found dead' in the tabular statement. Cocoons still occupied were kept through the winter and the following summer of 1944 in case any delayed hyperparasites might emerge, but not a single insect came out. At the end of the season these cocoons were opened and the results are tabulated as '1944 cocoons.' Specific identifications of parasites were not possible from their pupae, and therefore these specimens were only of value in calculating the *total* parasitisation.

Some of the cocoons collected were so undersized that it was suspected they were parasitised, and each was kept in a separate small tube; also others suspected, for one reason or another, to contain parasites. By this it was discovered that no *Zygaena* larva or pupa yielded more than one Tachinid, Ichneumonid or Chalcid, with one interesting exception. This was a cocoon on the outside of which were four Braconid cocoons, similar to clusters of others found attached to stems, from which *Apanteles zygaenarum* Marshall were reared. This cocoon yielded one specimen of the Ichneumonid *Casinaria orbitalis* Grav. and four *Apanteles*. This material was supplemented by examination of empty cocoons found in the field, and tabulated as 'field empties': these cannot give figures for specific parasites but supplement the totals for estimating the degree of destruction by either Diptera or Hymenoptera. So far as could be determined, the specimens of *Apanteles* that were reared represented seven *Zygaena* larvae.

All this material represented 2,564 *Zygaena* (full-fed larvae or pupae) of which 463 produced parasites, $=18{\cdot}1\%$ total parasitisation. Since *Apanteles* larvae leave their host to make their own cocoons on grass-stems, it is probable that the number of

Zygaena destroyed by them, as estimated by clusters of cocoons, is considerably below the mark, for their cocoons may very easily be overlooked. The destruction by Tachinidae was worked out as 7·9% ($\frac{203}{2564}$). The most abundant primary parasite was *Casinaria,* which amounted to 76·1% ($\frac{118}{155}$) of these, the next being *Apanteles,* which formed 19·4% ($\frac{30}{155}$) Secondary or hyper-parasites formed 23·6% ($\frac{48}{203}$) of the total identified Hymenoptera which were bred out, and of these *Gelis instabilis* was the most abundant, as 45·8% ($\frac{22}{48}$); *Hemiteles* produced thirteen specimens (27%) and *Itoplectis* ten (20·8%).

A very curious fact is that the first non-Lepidopterous insect to emerge from the collected cocoons was a female of *Bethylus cephalotes* Först., which was found in the exit tube on 9th June, only a few days after the earliest moths. Dr. O. W. Richards, who kindly identified it, was much puzzled; I gathered from him that it is not known from *Zygaena* as a host. No others ever appeared. It seems possible that it may have been clinging to a cocoon or stem when these were collected, and was not dislodged by the subsequent handling.

The identifications of the parasites were by the following gentlemen, to whom I am greatly indebted:—Tachinidae: Mr. Colbran J. Wainwright, who reported that the long series of *Phryxe longicauda* confirmed the view that it is almost a specific parasite of *Zygaena,* for records of it from other hosts are very few. Mr. J. F. Perkins wrote of the Ichneumonidae: 'Two species of primary parasites were bred from the cocoons of *Zygaena, Casinaria orbitalis* Grav. in numbers and one male and one female of a species of *Gambrus* belonging to the *G. inferus* Thn.—*G. ornatulus* Thn. group: it possesses characters of both species which may be synonymous. The remaining species are all secondary parasites, and in cases where I was able to see the cocoons have all parasitised *Casinaria. Hemiteles nana* Grav. Roman (=*H. fulvipes* Grav. Morley) attacks *Apanteles* larvae after they have emerged from the caterpillar in which they fed.' Mr. G. E. J. Nixon identified the *Apanteles* and wrote: 'The Chalcid appears to be *Habrocytus trypetae* Thomson. There are specimens of the latter in the collection named by Ferrière and labelled as bred from the seed-heads of *Centaurea* in which the host was a Trypetid fly. I can find no difference between these specimens and yours, but I confess I find the widely different choice of host awkward. I do not claim to have more than a fragmentary knowledge of Chalcids and it is possible that I have overlooked some small feature which might show your species to be different from the one named by Ferrière. It is possible, of course, that the *Habrocytus* responds to a particular kind of host-habitat rather than to the host itself.' To avoid uncertainty it may be said that although some of the Chalcids were taken from the tube closing the exit hole to the general breeding cage,

four at least emerged from small cocoons of *Zygaena* each kept by itself on a short piece of stem in a glass tube, as it was suspected of being parasitised. Thus the possibility that the Chalcids really came from *Centaurea* heads, included with the various stems on which cocoons were spun, may be dismissed.

The following notes are of interest as bearing on the subject of destruction of *Zygaena* by birds. I have previously (1944) related how I saw a cocoon on a wire fence opened by a Great Tit, which extracted the contents and fed a young bird therewith. A number of cocoons collected in the field were of considerable biological interest in this connection. (*a*) Two cocoons, freshly spun end-to-end, were found on 7th June on a sprig of a young hawthorn bush close to the ground. The one nearer to the base of the twig had been opened and the larva extracted; the distal one had also been opened but the larva had not been removed: it made good the damage to the cocoon and emerged as a moth on 29th June. (*b*) Two cocoons on a stout grass-stem, one overlapping the other, were found in June. One had been opened and lost its contents, the other produced a Tachinid in July. (*c*) Two cocoons, end-to-end, on a tall plaintain stem. The contents of one had been extracted, the other had been opened and the pupa pecked, and left. It ultimately died. (*d*) A cocoon had been opened, and the larva was pecked and injured but not extracted: there was much yellowish exudation around the opening in the cocoon. (*e*) A cocoon on a tall grass-stem, very thin and evidently not fully completed, had been torn open and the injured larva was hanging out head downwards. (*f*) A full-fed larva at the top of a tall grass stem was observed at 9.30 a.m. on 25th May. By 7 p.m. it had commenced its cocoon: at 9.30 a.m. next day the completed, strongly spun cocoon had been opened and the larva extracted. (*g*) Four other cocoons were found to have been opened and the contents fatally injured but not extracted. (*h*) A cocoon from which the contents had been extracted had an empty Braconid cocoon on the stem beneath it.

There can, I think, be little doubt that the larvae and pupae of *Zygaena filipendulae* have a considerable degree of distastefulness to birds, which is of less protective value during the time of great stress when the fledgling young from the nest drive the parents to desperation by their insistent clamour for food. Some of the damage may have been due to the young birds finding out for themselves what was edible, and thus being the agents of Natural Selection.

It is unfortunate for *Zygaena* that the larvae spin up just about the time when the demand for food by fledglings is at its height. Advancement of the time when young birds leave the nest, or retardation of the growth of the larvae in any season, might have very fortunate consequences for *Zygaena filipendulae*.

I have made a previous attempt (1937) to estimate the destruction of *Zygaena* by means of collected cocoons. As a result of the work now described I wish to correct some conclusions in that paper. Cocoons in categories 2B, 4, 5 and 6B would, I think, if they had been collected fresh with the experience I now possess, have been ascribed to damage by birds: the staining around the edge of an irregular hole is a characteristic result of a bird's peck. I have seen no signs of ants attacking undamaged pupae. Category 6B suggests that the bird had abandoned the attack and the Hymenopterous larva within the *Zygaena* had lived to maturity. It will be noted that the species of parasites from Cornwall differed widely from those tabulated below from Berkshire. The differences may in part be due to the different dates at which the material was collected. The parasites bred in Berkshire all emerged before the date at which the Cornish material was collected.

In conclusion, I wish to thank Mr. E. Taylor, Senior Laboratory Assistant, for the care he took in mounting the specimens, and for recording and marshalling the data so that I could present them in tabular form with the least labour to myself: during the height of the season of emergence, when over a hundred specimens might emerge on one day, the task was an arduous one.

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	Zygaena		Diptera		Primary Hymenoptera				Secondary Hymenoptera			
	lonicerae Esp.	*filipendulae* L.	*Phryxe longicauda* Wainwright	*Neopales pavida* Mg.	*Casinaria orbitalis* Grav.	*Gambrus* sp.	*Apanteles zygaenarum* Marshall	*Habrocytus trypetae* Thomson	*Gelis instabilis* Först.	*Gelis* sp.	*Itoplectis maculator* F.	*Hemiteles nana* Grav. Roman
June 4-11 ...	–	20	–	–	–	–	–	–	–	–	–	–
,, 9	–	–	–	–	2	–	–	–	–	–	–	–
,, 12	1	3	–	–	–	–	–	–	–	–	–	–
,, 13-14 ...	–	50	–	–	–	–	–	–	–	–	–	–
,, 15	–	32	4	–	–	–	–	–	–	–	–	–
,, 16	–	58	3	–	5	–	–	–	–	–	–	–
,, 17	–	49	4	–	4	–	–	–	–	–	–	–
,, 18	–	29	1	–	2	–	–	–	–	–	–	–
,, 19	–	12	1	–	2	–	–	–	1	–	–	–
,, 19-21 ...	–	57	7	–	1	–	–	–	–	–	–	–
,, 21	–	–	14	1	3	–	–	–	–	–	–	3
,, 22	–	30	5	3	1	–	9	–	1	–	–	6
,, 23	–	27	4	6	2	–	–	–	–	–	–	2
,, 24	–	38	8	6	1	–	–	–	–	–	–	1
,, 25	1	26	3	4	2	–	–	–	–	–	–	1
,, 26	1	22	–	–	3	–	–	–	–	–	–	–
,, 27-28 ...	–	113	11	8	19	–	1	–	–	–	–	–
,, 29	–	66	1	4	4	–	8	–	–	–	–	–
,, 30	–	39	1	2	6	–	5	–	2	–	–	–
July 1	1	42	1	7	3	–	–	–	2	–	–	–
,, 2	–	41	1	11	4	–	–	–	1	1	–	–
,, 3-5 ...	–	83	3	9	10	–	7	–	2	–	1	–
,, 6	–	30	1	4	4	–	–	1	3	–	–	–
,, 7	1	13	2	8	3	–	–	–	–	2	–	–
,, 8	–	15	–	3	3	–	–	–	2	–	–	–
,, 9	–	8	+25*		3	–	–	–	–	–	–	–
,, 10-12 ...	–	18	1	5	–	–	–	–	1	–	–	–
,, 13	–	7	–	5	4	–	–	–	1	–	2	–
,, 14	–	4	–	1	1	–	–	–	1	–	–	–
,, 15	–	3	–	1	–	–	–	–	–	–	1	–
,, 16	–	7	–	–	1	–	–	–	–	–	–	–
,, 17-19 ...	–	7	1	1	8	–	–	1	–	–	–	–
,, 20	–	1	–	–	4	–	–	–	–	–	1	–
,, 21	–	1	–	–	–	–	–	–	–	–	–	–
,, 22	–	2	–	–	2	–	–	–	1	–	1	–
,, 23	–	4	–	–	1	–	–	–	–	–	1	–
,, 24-26 ...	–	15	+1*		7	–	–	–	–	–	1	–
,, 27	–	3	–	1	–	–	–	–	–	–	–	–
,, 28	–	2	–	–	–	1	–	2	–	–	1	–
,, 29	–	2	–	–	–	1	–	–	1	–	1	–
,, 30	–	–	–	–	–	–	–	–	1	–	–	–
,, 31	–	–	–	–	–	–	–	1	–	–	–	–
,, 31—Aug. 2	–	–	–	1	–	–	–	–	1	–	–	–
Aug. 2-5 ...	–	–	–	–	–	–	–	–	1	–	–	–
,, 6	–	–	1†	–	–	–	–	–	–	–	–	–
,, 17	–	351†	–	–	3	–	–	–	–	–	–	–
Totals ...	5	1330	78	91	118	2	30	5	22	3	10	13

		Diptera	Ichneumons	Braconid
1944 cocoons	706	28	47	0
Field empties	133	1	32	1

*Escaped unidentified. †Found dead.

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CONTENTS—CONTINUED

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